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U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS.

INSTRUCTIONS TO FIELD PARTIES

AND

DESCRIPTIONS OF SOIL TYPES.

FIELD SEASON, 1903.

1903

JANUARY.

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1904

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NOTE.

The accompanying instructions have been prepared for the use of field men of the Bureau of Soils. The material on fiscal regulations is in addition to the Fiscal Regulations as issued by the Division of Accounts and Disbursements and should be taken as supplementary to these Department Regulations. All field men should be careful that their accounts conform strictly to these regulations.

The descriptions of soil types are given as an aid to the field parties in correlation of soil types and should be carefully studied to this end. Soils of a new area should be correlated with a known type where this is possible.

MILTON WHITNEY,
Chief of Bureau.

WASHINGTON, D. C., *March 13, 1903.*

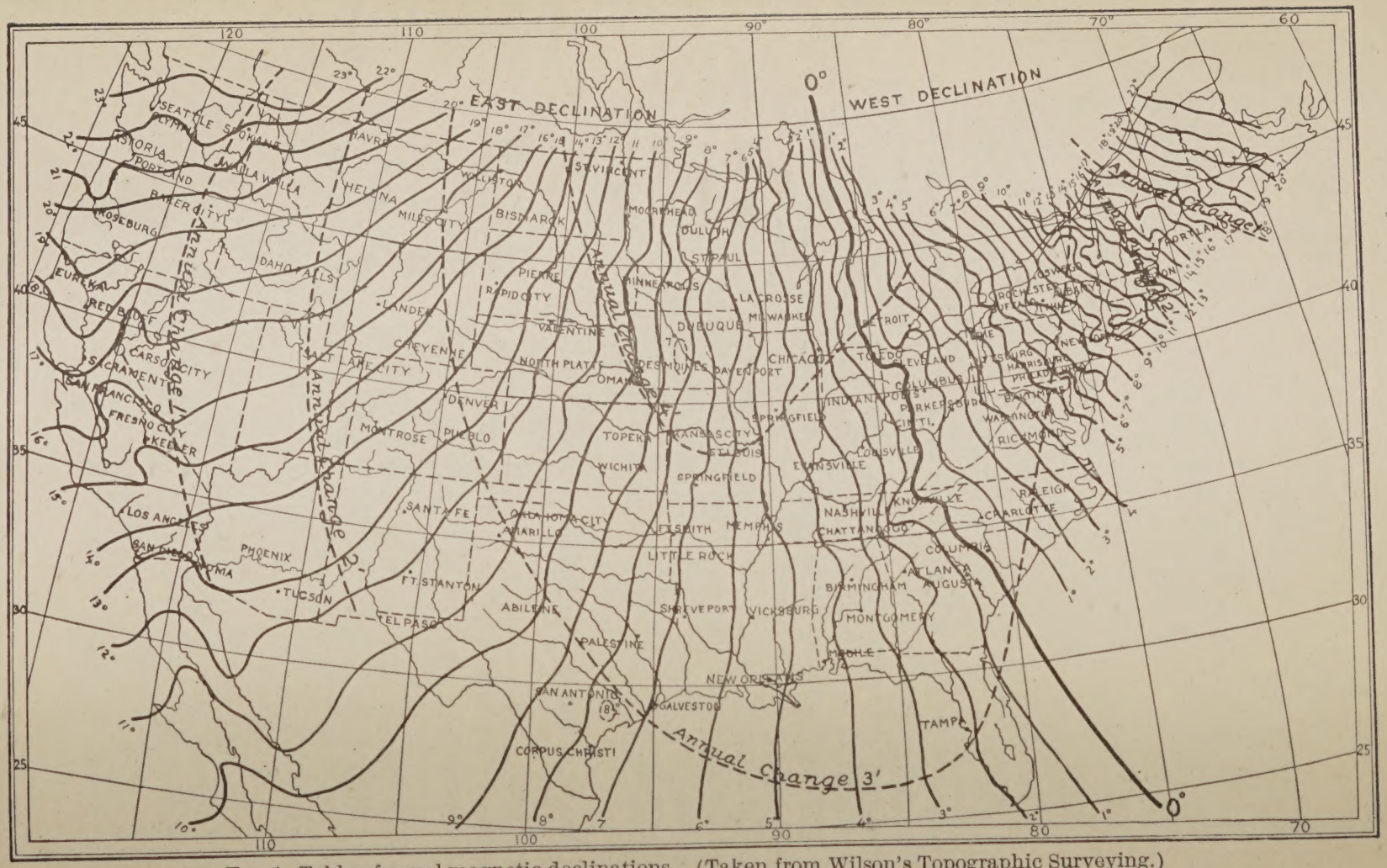

FIG. 1. Table of equal magnetic declinations. (Taken from Wilson's Topographic Surveying.)

CONTENTS.

TEXT FIGURE.

INSTRUCTIONS TO FIELD PARTIES AND DESCRIPTIONS OF SOIL TYPES.

INSTRUCTIONS TO FIELD PARTIES.

Fiscal regulations.—The pamphlet on "Fiscal Regulations of the Department of Agriculture" issued by the Division of Accounts and Disbursements applies to all fiscal matters of this Bureau, with certain modifications and additions given below. Field agents of this Bureau should carefully read the regulations and conform literally to the instructions given there. Monthly accounts are frequently delayed in payment because of the failure to conform to the rules of the Department. Delays of this character can be entirely avoided if field men are careful to have all accounts conform literally to instructions given in the Fiscal Regulations and to make explanation of all items of expenditure on the subvouchers. All expenses not accompanied by subvouchers (subvouchers must be submitted for purchases amounting to $1 or more) should be fully explained in a memorandum attached to voucher. Charges for lodging and team hire must always be supported by subvoucher.

Duplicate vouchers on Form 4, with subvouchers (Forms 4a, 4b, 4c) are to be submitted promptly at the end of each month, properly filled out, and signed before a notary. The receipt and oath should be signed on each voucher in all cases, but the notary's signature and seal should be on but one voucher. Every voucher for reimbursement of traveling expenses must be accompanied by Form 4c, showing what portion of the travel has been performed on transportation requests. When no requests have been used a blank form properly signed should be filed with the voucher, and a statement made on this form showing that no transportation requests were used.

Authorization to travel.—An authorization from the Chief of the Bureau of Soils must be obtained before any travel is performed for the Department, and written or telegraphic authorization must be obtained for all travel outside of an area or where unusual expense or additional travel is necessary.

Transportation.—Travel to and from areas should be performed on transportation requests where the cost of travel amounts to $3 or more. (See Fiscal Regulations, par. 15, et seq.) West of the Mississippi River all travel should be performed on transportation requests on bond-aided or land-grant railroads. Transportation requests will be furnished on application to the chief clerk of the Bureau. Applications for these requests should be made at least one week before the travel is to be performed. In filling out transportation requests, before presenting to ticket agent, be sure to fill in all blanks upon the face of the request. The stub on end of request is to be filled out when the request is issued and returned at once to the Bureau of Soils.

Freight and express.—When express charges are included in an expense account, the original express receipt must be attached to the subvoucher. Express charges to Washington, D. C., should not be prepaid, but the shipments should be made "collect."

When possible, shipments should be made by freight rather than by express. Shipments by freight from points west of the Mississippi River should be made according to paragraph 14, Fiscal Regulations. The property to be sent should be securely packed, and notice should be given to the Chief of the Bureau, fully describing the property and giving the full name and address on the package, with the name of the person in whose care the property is stored.

Allowances for field parties.—While engaged in actual travel the limits of expense should be governed by the Fiscal Regulations (par. 12g). While in an area engaged in field work not more than $1.50 per day per man on an average is to be paid for subsistence; when possible, cheaper rates should be secured.

The usual rate for hire of horse and buggy is $1.50 per day. This rate should not be exceeded, except where actually necessary. If it is found that proper conveyances can not be secured in an area at this price the fact must be made known to the Chief of the Bureau at once.

When the party remains at one place for a period of more than

one week, cheaper rates by the week can nearly always be secured. Advantage should be taken of such weekly rates. When boarding at reduced rates it sometimes happens that the party is away from the regular boarding place for one or more meals, or perhaps an entire day. The Fiscal Regulations explicitly state that subsistence expenses can not be allowed at more than one place, but it has been ruled that when reduced rates are being paid subsistence expenses will be allowed for short periods away from the regular boarding place, provided the extra expense plus the reduced rate does not exceed the week rate calculated at the regular day rate. Thus, if a party is living at a hotel or boarding house the regular rates of which are $2 per day, and by reason of staying for one week or longer a rate of $1.50 per day is secured, and it should happen that the party could not get back to the hotel, but took meals or lodging away (paying for the meals or lodging), the cost of these would be allowed, provided the entire week's expenses did not amount to more than $14. Duplicate charges of this character are allowed only in the interest of economy, and should not be incurred, except when absolutely necessary. Where such duplicate charges are made, a full explanation must be made satisfactory to the Chief of the Bureau and the disbursing officer.

Subvouchers for team hire.—The following form shows a subvoucher for team hire completely filled out. All such subvouchers should describe rig, state dates used and number of hours in use, give distance traveled and use to which team was put. In case a team is used on Sunday or a holiday, the reason for using it should be stated.

Form No. 4*b*. Subvoucher No. 1.

$7.50. City or town, COLUMBUS, OHIO,
Date, *Dec. 27, 1901.*

Received of John Smith, U. S. Department of Agriculture, Seven and $\frac{50}{100}$ dollars.

For hire of horse and buggy for use in soil mapping Dec. 23, 24, 25, 26, and 27, five days, at $1.50 per day 7.50
In use 8 hours per day. Average distance traveled, 20 miles.

Team used on Dec. 25 was on official business.

(Signature) JAMES SCOTT,
(Title) *Owner of team.*

Signatures to subvouchers.—Paragraph 35 of the Fiscal Regulations contains explicit instructions regarding the signatures to subvouchers. Care should be taken that all signatures conform to these instructions. All signatures must be written in ink. The name of the person signing the receipt must appear upon the receipt, and the authority for signing must appear in the title, which must be written by the signer below his name. Where a subvoucher is signed by mark, one disinterested witness should sign the subvoucher and give his address. When a firm name or a hotel name is signed to a subvoucher, the full name and title of the person receiving the money must also be given.

Laundry.—With regard to the item of laundry in expense accounts where parties are located for any length of time at a particular point, it is usually possible to make arrangements by which laundry may be done at a fixed price, usually about 50 cents per week per person, and wherever this is practicable it should be done. It will, however, happen that parties who are traveling or are moving their headquarters frequently will be unable to make arrangements of this kind, and in such cases the expense for laundry will necessarily exceed this amount; in no case, however, must the charge for laundry exceed $4 per person per month, and expense accounts containing charges in excess of this amount will be corrected.

Telegrams.—Telegrams sent at Government rates should refer only to official business. The Treasury Department has ruled, however, that chiefs of parties who are responsible for the accounts of the party may telegraph in regard to salary checks or expense-account checks which have been delayed, when the money is needed for use in defraying the expenses of the party. Such telegrams, however, should not be sent except when the delayed check has been awaited a reasonable time. Telegrams regarding leave should not be sent at Government rates or charged to the Department.

The Chief of the Bureau should be informed by telegraph of every change in address of the party in the field. In sending telegrams to the Bureau, address "Soils, Washington, D. C.," and sign the telegrams by last name only.

Location of headquarters while in field.—The attention of the assistants of the Bureau of Soils is directed to the advisability and real necessity of keeping as near as possible to their field of operations.

In no case where it can be avoided should a man be located at a greater distance than 6 miles from the area to be surveyed, as 12 miles distance there and back, added to the day's work, is a material hardship on the team, and reduces considerably the amount of work that can be done in the course of the day.

For the most part the field work of the Bureau is carried on in well-settled districts, where it should be possible to obtain board and lodging for a few days at least in farmhouses, provided there are no hotels or lodging houses convenient to the area to be surveyed.

There is no objection to obtaining rates by the week, and this is advisable where the place is conveniently located for the work, and will be found cheaper than paying by the day, but no longer term should be provided for, except in certain circumstances, as in most cases a field party should be able to survey a sufficient area in one or two weeks to warrant a removal to some more convenient place. It happens at times, however, that for lack of accommodations a longer time than this has to be spent in one locality or else a camp outfit be provided. The Fiscal Regulations of the Department (paragraph 12 g) provide that board and lodging can only be paid for a period not to exceed thirty days in any one locality, and this regulation holds against the field assistants in this Bureau, except that where suitable accommodations can not be obtained and camp outfits are not provided, the Secretary of Agriculture (in letter of authorization No. 5611) has empowered the Chief of the Bureau to grant an extension of time in which board and lodging will be allowed in any one locality to sixty days, or to any shorter term within his discretion.

When from any cause it is considered necessary or advisable to remain in one place for a period exceeding thirty days, the Chief of the Bureau must be notified and satisfactory reasons given him why the party should remain longer than thirty days, and if in his judgment the reasons are sufficient, the length of time will be extended and the disbursing office notified of the fact, so that the accounts will be passed in that office. Such action must be taken specifically for each case, and the request for an extension of time must be mailed a sufficient length of time in advance to allow of action being taken. Otherwise in no case will the board and lodging be allowed in any one locality for a period exceeding thirty days.

Accidents to parties.—The following general instructions are issued for the guidance of field men of the Bureau of Soils, in the event of possible accidents to teams or vehicles that may be hired by them for official use in the field.

Should an accident occur which results in any damage to a horse or vehicle under your care, and if such accident is due to carelessness or fault on your part, or that of your assistants, it will be considered a personal responsibility of your own, and you will be expected to make the necessary settlement with the owner. The settlement will devolve upon you in the event of the accident being due to fast or reckless driving, excessive use, or in any other case in which you can not show that proper judgment and care and reasonable precautions have been used.

If an accident should be due to causes for which you are not responsible it might constitute a claim against the Government, and if such claim was approved by the Department, the matter would be referred to Congress for an appropriation to reimburse the owner. In such cases you are cautioned *not to pay the claim*, but to refer the matter to this Department; payment of such claim by you would constitute prima facie evidence that the accident was due to carelessness on your part, and the matter could not then be handled by the Department. Should the horse be taken sick, or if an unforeseen and unavoidable accident should occur to either horse or vehicle while in the employ of the Department, claim should be made, accompanied by affidavits, properly sworn to, setting forth all the facts of the case and substantiated in every possible way by disinterested witnesses.

The greatest care is enjoined upon all representatives of the Bureau in the care of teams and in their safe delivery to owners after use.

Settlement of claims of this kind through Congress are very troublesome and tedious, and they should not be presented to the Department if it is possible to avoid it, and then not unless it involves considerable money and is accompanied by strong and irrefutable evidence that the Department agent is not responsible. Such claims will be scrutinized very carefully before being acted upon by this Department.

Six-months reports.—On the 1st of July and 1st of January of each year a report upon Form No. 41 of this Bureau should be made out by each assistant in charge of party and forwarded to the Chief of the Bureau. This report shows the area surveyed in each district,

the cost per square mile, and the actual time given to the survey. In order that assistants may make out this report, memorandums should be kept of all expenses. In calculating cost of work include salaries, subsistence while in the area, and team hire, with any necessary miscellaneous expenses. Transportation expenses (which include railroad fare, sleeping-car fare, meals en route, etc.) should not be included in calculating cost per square mile. The salary should also only be calculated for the time actually spent in the area.

INSTRUCTIONS FOR MAPPING SOILS AND ALKALI.

Organization of field party.—A field party in the soil survey usually consists of two men—an assistant in charge of party and a field assistant. The assistant in charge of party shall control all field work of the party, prepare the report and maps, carry on all correspondence necessary to the conduct of the survey, pay all field expenses of the party, and forward monthly expense accounts to the office of the Bureau in Washington. The field assistant shall perform all duties required of him by the assistant in charge.

Outfit for work.—The outfit for field work consists of the following:

Soil auger, 40-inch handle.
Geologist's hammer.
Notebooks.
Compass or plane table.
Odometer.
Chain scale.
Set of colored pencils.
Base map.
Sacks and tags for collecting samples of soil.
Cards for reporting samples collected (Forms 46, 47, 48).
Copy of Field Instructions.

In addition to the above certain parties should add:

Alkali outfit.
Extension auger and pipe wrenches.
Filter pump.
Metallic tape 50 feet long.

These supplies are to be obtained on application to the property clerk of the Bureau, countersigned by the chief clerk. Memorandum receipts are taken by him for all supplies issued. Additional supplies, stationery, etc., needed while in the field are to be ordered

on card, Form 43. The loss of, or damage to, any supplies should be at once reported to the chief clerk, with an explanation of the cause of such loss or damage.

Prosecution of field work.—All mapping should be on a scale of 1 inch to 1 mile. Where possible, base maps on this scale will be furnished all field parties before entering the field. Wherever such maps are supplied it is supposed that they are the most reliable and complete maps obtainable. Field parties should endeavor to correct the base map if it is found in error. Frequent check upon directions should be made with the compass, and all distances on roads are to be measured with the odometer. Where from the nature of the error it is found impossible to make correction, the soil map should conform to the base used, but careful note should be made of all such errors, so that in case a revised edition of the map is published the correction can be made without a resurvey of the soils.

Odometer.—The Bell odometer has been adopted for use in all measurements. The instrument should be clamped to the axle of the vehicle by the band which supports the shafts. The iron pin is driven in the end of the hub and is bent so that as the wheel revolves the end of the pin strikes just the swell of the cogwheel on the odometer. If the instrument is carefully adjusted very little trouble is experienced in its use. The red hand revolves once every mile, giving the fractions of a mile, each space representing one-fortieth of a mile, or 8 rods. Each revolution of the red hand moves the yellow hand one space, representing the miles up to 40 in one revolution around the dial, and shown by the inside figures. Each revolution of the yellow hand moves the black hand one space, each space representing 40 miles, and shown by the outside figures. The sum of the indications of the three hands gives the mileage. Each odometer is adapted to but one sized wheel. In case it is impossible to obtain a vehicle with a wheel of the proper size for the odometer you have, the readings must be corrected in order to read miles. Should any other sized wheel be used, the following formula will enable the proper correction to be made:

$$x = \frac{ad}{d_1}$$

Where x is distance traversed in fortieths of a mile, d is the diameter of the wheel to be used, d_1 is the diameter of wheel to which the

odometer is adapted, and a is number of dial divisions as read from odometer.

The instruments furnished by this Bureau are nearly all adapted to a 42-inch wheel. The following table will enable the proper correction to be made when any other than a 42-inch wheel is used. The figures in the first column are the dial divisions as read from the odometer, and the figures in the other columns give the distance traveled in fortieths of a mile. Chain scales divided into 40 parts to an inch are supplied for convenience in platting distances as measured or calculated in this table.

Table for reducing odometer readings to fortieths of a mile.

Dial divisions.	Wheel diameter—inches.							
	38	39	40	41	43	44	45	46
1	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1
2	1.8	1.9	1.9	2.0	2.0	2.1	2.1	2.2
3	2.7	2.8	2.9	2.9	3.1	3.1	3.2	3.3
4	3.6	3.7	3.8	3.9	4.1	4.2	4.3	4.4
5	4.5	4.6	4.8	4.9	5.1	5.2	5.4	5.5
6	5.4	5.6	5.7	5.9	6.1	6.3	6.4	6.6
7	6.3	6.5	6.7	6.8	7.1	7.3	7.5	7.7
8	7.2	7.4	7.6	7.8	8.2	8.4	8.6	8.8
9	8.1	8.4	8.6	8.8	9.2	9.4	9.6	9.9
10	9.0	9.3	9.5	9.8	10.2	10.5	10.7	11.0
11	9.9	10.2	10.5	10.7	11.3	11.5	11.8	12.0
12	10.8	11.1	11.4	11.7	12.3	12.6	12.8	13.2
13	11.7	12.1	12.4	12.7	13.3	13.6	13.9	14.2
14	12.6	13.0	13.3	13.7	14.3	14.7	15.0	15.3
15	13.5	13.9	14.3	14.6	15.3	15.7	16.1	16.4
16	14.4	14.8	15.2	15.6	16.4	16.8	17.1	17.5
17	15.3	15.8	16.2	16.6	17.4	17.8	18.2	18.6
18	16.3	16.7	17.1	17.6	18.4	18.8	19.3	19.7
19	17.2	17.6	18.1	18.5	19.4	19.9	20.3	20.8
20	18.1	18.6	19.1	19.5	20.5	20.9	21.4	21.9
21	19.0	19.5	20.0	20.5	21.5	22.0	22.5	23.0
22	19.9	20.4	20.9	21.4	22.5	23.0	23.5	24.1
23	20.8	21.3	21.9	22.4	23.5	24.1	24.6	25.2
24	21.7	22.3	22.8	23.4	24.5	25.1	25.7	26.3
25	22.6	23.2	23.8	24.4	25.6	26.2	26.8	27.4

Table for reducing odometer readings to fortieths of a mile—Continued.

Dial divisions.	Wheel diameter—inches.							
	38	39	40	41	43	44	45	46
26	23.5	24.1	24.7	25.4	26.6	27.2	27.8	28.5
27	24.4	25.1	25.7	26.4	27.6	28.3	28.9	29.6
28	25.3	26.0	26.6	27.3	28.6	29.3	30.0	30.7
29	26.2	26.9	27.6	28.3	29.7	30.4	31.1	31.8
30	27.1	27.8	28.6	29.3	30.7	31.4	32.1	32.9
31	28.0	28.8	29.5	30.3	31.7	32.5	33.2	33.9
32	28.9	29.7	30.4	31.2	32.7	33.5	34.3	35.0
33	29.8	30.6	31.4	32.2	33.8	34.6	35.3	36.1
34	30.7	31.6	32.4	33.2	34.8	35.6	36.4	37.2
35	31.6	32.5	33.3	34.2	35.8	36.6	37.5	38.3
36	32.5	33.4	34.3	35.1	36.8	37.7	38.6	39.4
37	33.4	34.3	35.2	36.1	37.9	38.7	39.6	40.5
38	34.4	35.3	36.2	37.1	38.9	39.8	40.7	41.6
39	35.3	36.2	37.1	38.1	39.9	40.8	41.8	42.7
40	36.2	37.1	38.1	39.0	40.9	41.9	42.8	43.8
41	37.1	38.0	39.0	40.0	41.9	42.9	43.9	44.9
42	38.0	39.0	40.0	41.0	43.0	44.0	45.0	46.0
43	38.9	39.9	40.9	42.0	44.0	45.0	46.1	47.1
44	39.8	40.8	41.9	42.9	45.0	46.1	47.1	48.2
45	40.7	41.8	42.8	43.9	46.0	47.1	48.2	49.3

Plane-table traversing.—It is sometimes impossible to furnish the field party with a base map of proper accuracy. In all such cases the party will be supplied with a plane-table outfit, and a traverse base map of the area is to be constructed in the field by the soil-survey party. This traverse work should, however, be reduced to a minimum.

In carrying on traverse work or surveying of any description, the methods used, where possible, should conform to well-established methods, such as are given in Wilson's Topographic Surveying.

In order to orient plane-table maps to true north and south, the map on page 4, showing the lines of equal magnetic declination, is given. The solid lines show equal declination and the dotted lines show equal annual change. The lines are moving westward, so that where the declination is east it decreases, and where west it increases annually.

Establishing soil types.—At the end of this pamphlet is given a concise description of all of the types of soil described by this Bureau up to December 31, 1901. In establishing types in an area this list should be carefully consulted, and where possible all types are to be correlated with types there described. As soon as a type is determined upon, whether new or previously described, a description of it should be sent to the Bureau on Form 46. The selection of a provisional name for each soil type should be made, and in all correspondence and reports this name should be used when speaking of the type.

In the humid portions of the country the description of a soil type is to extend to a depth of 3 feet, and in the semiarid and arid regions to a depth of 6 feet. In speaking of a type the material to these depths is meant, not the surface soil alone.

Correlation of soil types.—It is very desirable, from all points of view, that close attention be paid to the correlation of soils. It is very undesirable to increase the number of soil types more than is necessary, and wherever a soil can consistently be put under an established type it should be done. Much advance has been made in the past year in this matter of correlation and in using the names of soils to bring out their relations. Several of the original types have been merged into others, or have been given new names to bring them into a uniform series, where this could be done without danger of confusion. In doing this the object has been to establish certain series in the different physiographic divisions of the United States, and we are finding that there are a few general classes of soils that are in a way related. Prominent among these are the Norfolk, Miami, Fresno, Cecil, and Hagerstown series. In each of these we have found or expect to find a stony loam, a gravel, gravelly loam, sand, fine sand, sandy loam, fine sandy loam, loam, silt, clay loam, and clay.

In the Norfolk series we should have classed the Susquehanna gravel as Norfolk gravel, and the Selma silt loam as Norfolk silt loam, and we would have had this series almost complete. We should have classed the Alamance silt loam as the Cecil silt loam, and the Durham sandy loam as the Cecil sand, and then we would have had this series almost complete. We have the Hagerstown series prac-

tically complete, and also the Miami series, after changing certain of the Allegan types established last year.

When the Norfolk sand is being deposited the conditions somewhere in the area will undoubtedly be favorable to the deposition of gravel, of silt, of fine sand, of loam, and of clay, and wherever material of these characters is encountered, presumably coming from the same source and being deposited essentially at the same time, they should be given this distinctive name so as to show their relation to one another. Knowing as we do the processes of soil formation, either from the disintegration of rocks in place or the transportation by wind or water, we should expect that materials from the same source would differ in their texture. The relationship of the derived soils should be shown by the use of a common name.

There will be found in nearly all areas soils of local origin and of exceptional character which will have to be given local names, but so far as possible the soils encountered by field men should be correlated with established types, preference being given where possible to some of the great classes above described. As a rule, these great classes should be confined to certain physiographic areas, that is, the names of the Coastal Plain soils should not be carried over into the Piedmont or into the Glacial areas, unless the character of the material and its mode of formation as well as its agricultural value are sensibly the same. For example, during the past season the name Alloway clay, which was originally used in the Coastal Plain series, was approved for a soil having exactly the same texture and precisely the same mode of formation in a river delta in one of the New York areas within the limits of the drift, but only in exceptional cases should this be done.

It must be remembered, also, that where the same name is used for a soil in different states, as the character of the soil is described in each place a somewhat wider latitude can be given than if the soil in the two places had to be brought under the same detailed description, and while care should be taken in these correlations, it is extremely helpful to the Bureau to have the field men suggest the possibilities that may aid in the final determination of the name.

Samples for laboratory examination.—To avoid unnecessary work and to prevent overcrowding of the laboratory force, it will be very necessary to use care and judgment in the selection of samples for mechanical or chemical examination.

Soil samples, as a rule, should not be collected until the party has obtained a very thorough acquaintance with the type conditions; then a description of the soil should be sent in upon Form 46. This description should be of so general a nature that it will apply to all samples collected from that soil in that district. Then, too, this type description should be made of every soil type found in the district, whether it is correlated with a soil occurring in other districts or is a new type.

After this general description has been sent in a limited number of samples from not exceeding four places in each soil type, and limited to one or two localities in the case of less important types, should be collected and the individual samples described on Form 47, one card being used for each sample, whether it is of a soil or subsoil, and each sample being designated by the local name adopted for the type to which it belongs.

It will be better to defer taking samples until the work has progressed sufficiently far to insure a thoroughly representative set of samples.

A separate card (Form 48) is provided for miscellaneous samples, such as marl, minerals, crusts, and plants, and in all cases such samples should be fully described, and the kind and purpose of the examination desired should be clearly stated. Often a qualitative examination will answer if we know the purpose of the work, and thus the long and tedious process of a complete chemical analysis may often be avoided.

Care in attending to these details will insure the greatest accuracy, and the earliest completion of the work; so that the results may be available as soon as possible, preferably before the party leaves the district.

Write all cards and tags on samples of soil in ink, as pencil rubs badly and is sometimes illegible when received in the office.

Correspondence and weekly report.—All correspondence with the Bureau should be addressed to the Chief of the Bureau. At least once each week the head of the party should report to the Chief by letter, informing him of the progress of the work, the results which have been attained, describing new types of soil, and giving a statement of the health of members of the party.

At the end of each week a report on card, Form 49, should be filled out and returned to this office. This card report is not to take

the place of a weekly letter, but should be accompanied by a letter giving in detail the operations of the party. The cards will be filed in the office for ready reference.

Field and office maps.—As fast as the soil maps are completed copies should be sent to the Chief of the Bureau to be filed. To facilitate this two copies of the base map are to be made. One copy should be cut into sections not more than 5 by 7 inches in size. As soon as the soils have been surveyed on a section an exact copy should be made and forwarded to the office. With each section should be sent a legend and a profile of each soil type. On the completion of an area or sheet all field maps with complete legend and profile and all notebooks, plane-table sheets, or data collected are to be forwarded by registered mail. The field copy should be correct in every detail when sent to the office, as the copy that is sent to the printer is prepared from this or corrected from this, and not from the office copy. Necessary changes in the office copies previously forwarded will be made in this office from the original field copy. The field copy will be the official copy until the map is published. It should therefore be as distinct and as accurate as possible.

Directions for mapping alkali soils.—The intervals for the alkali maps are to represent, respectively, 0.20, 0.40, 0.60, 1, and 3 per cent of salt in the dry soil. The maps are to be constructed in the field directly from the resistances.

Standardizations have been made in 15 areas, and a study of the curves reveals the fact that there is very little difference between them; certainly no more difference between curves from different areas than has been found by duplication of the standardization in one area. The following table shows the standardization made up from an average of these 15 curves. This table should be used in all reconnoissance work and can be used in all alkali surveys, except where it is found the curve does not give reliable results or where unusual accuracy is required. In such cases a new curve should be made according to the instructions given.

Average standardization—Table of limiting values.

Salt in soil.	s. and ssc.	sc.	scc.	c. and hc.	Average.
Per cent.	*Ohms.*	*Ohms.*	*Ohms.*	*Ohms.*	*Ohms.*
3.00	21.9	24.9	26.7	27.4	25.2
1.00	43.7	45.3	47.7	48.8	46.4
.60	65.9	68.8	71.1	73.5	69.8
.40	92.1	95.3	98.7	101.4	96.9
.20	163.6	172.5	178.7	193.4	177.1

The difference between the resistances for the various grades of soil is so small as to be within the limit of accuracy of the method, so that hereafter texture may be entirely disregarded and the figures in the last column used as the limiting values.

For convenience, where it is desired to determine the percentage of alkali from the resistance at 60° F., the following table has been picked out from the average standardizations:

Table showing percentage of salt in soil.

Resistance at 60° F.	s. and ssc.	sc.	scc.	c.
	Per cent salt.	*Per cent salt.*	*Per cent salt.*	*Per cent salt.*
20	3.12	.....	.....	.....
25	2.65	2.98	3.19	3.30
30	2.18	2.43	2.65	2.79
35	1.69	1.91	2.13	2.28
40	1.18	1.40	1.63	1.77
45	.95	1.02	1.18	1.28
50	.83	.89	.94	.97
55	.74	.80	.84	.87
60	.67	.71	.74	.78
65	.60	.64	.67	.71
70	.55	.58	.61	.65
75	.51	.54	.56	.59
80	.47	.51	.52	.54
85	.44	.47	.49	.50
90	.41	.43	.45	.47
95	.38	.40	.42	.44
100	.36	.37	.39	.41

Table showing percentage of salt in soil—Continued.

Resistance at 60° F.	s. and ssc.	sc.	scc.	c.
	Per cent salt.	*Per cent salt.*	*Per cent salt.*	*Per cent salt.*
105	0.34	0.35	0.37	0.38
110	.32	.33	.35	.36
115	.30	.31	.33	.34
120	.29	.30	.31	.33
125	.27	.28	.30	.31
130	.25	.27	.28	.30
135	.24	.26	.27	.29
140	.23	.25	.26	.28
145	.22	.24	.25	.26
150	.21	.23	.24	.25
155	.21	.22	.23	.24
160	.20	.21	.22	.23
165	.20	.21	.22	.23
170	.19	.20	.21	.22

If more accurate work is to be done, or it is believed the above limits do not fit the conditions, the work is to be standardized in each district in the following way: Take eight or ten crusts, including the top inch of soil, or if crusts can not be obtained, take the strongest alkali soils from different places over the whole area. Fill a large cup, tumbler, or bottle about one-third full with a crust or soil, using more or less, according to the richness of the material, and nearly fill the receptacle with distilled water. Stir or shake vigorously several times and filter off a pint of the solution, using the filter pump. Rinse out the filter pump after each sample. Treat the eight or ten crusts or soils in the same way. The presence of black alkali will frequently give the solutions a reddish color, but this can be ignored. Determine the electrical resistances of the solutions in the cell. Take an amount of the strongest solution equivalent to approximately 200 cc. having a resistance of about 5 ohms, and add to it a volume of each of the others proportional to the resistances determined. If the resistance of this mixture, containing approximately equal quantities of salts from the eight or ten localities, is 10 ohms or less it can be used directly for the standardization. If the resistance is greater than 10 ohms, the solution should be evaporated until the

resistance is sufficiently low. Carefully measure out 100 cc. of this composite solution and transfer it to a small dish which has been carefully cleaned, dried, and accurately weighed to centigrams. Evaporate to dryness, ignite very gently to free the sulphates and carbonates of water of crystallization, let cool, and again weigh. The gain in weight will give the percentage in salts in the composite solution. This percentage divided into any percentage in the following table multiplied by 100 will give the number of cubic centimeters of the composite solution required to be diluted to 100 cc. in order to obtain the corresponding percentage in first column of the table. If the volume thus secured for some of the higher concentrations exceeds 100 cc., it should be reduced to 100 cc. by evaporation. Ordinarily a $3\frac{1}{3}$ per cent solution is as concentrated as will be required, as this represents 1 per cent of salt in the soil. The electrical resistance of this $3\frac{1}{3}$ per cent solution in any cell, divided by 0.24, will equal the resistance of sand or sandy loam in the same cell when completely saturated, and at a temperature of 60° F., when the soil contains 1 per cent of salt. The composite solution is to be diluted and the resistance determined at the various concentrations, corresponding to the limiting values of the alkali map for four grades of soil.

The dilutions are as follows, the figures representing the percentage concentration to which the solution is to be reduced:

To obtain limiting values.

Salt in soil.	Salt in solution.			
	s. and ssc.	sc.	scc.	c. and hc.
Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
3.00	10.00	7.95	7.14	6.67
1.00	3.33	2.65	2.38	2.22
.60	2.00	1.59	1.43	1.33
.40	1.33	1.06	.95	.89
.20	.67	.53	.48	.44
Resistances to be reduced to 60° F. and divided by .24		.275	.29	.30

NOTE.—S. and ssc., sand and sandy loam; sc., loam; scc., clay loam; c. and hc., clay and heavy clay soil.

The result will give the cell resistance, when filled with saturated soil, at 60° F., corresponding to the limiting values to be inserted in the following table:

Table of limiting values.

Salt in soil.	s. and ssc.	sc.	scc.	c. and hc.
Per cent.	*Ohms.*	*Ohms.*	*Ohms.*	*Ohms.*
3.00	.....	.....	.....	.....
1.00	.....	.....	.....	.....
.60	.....	.....	.....	.....
.40	.....	.....	.....	.....
.20	.....	.....	.....	.....

NOTE.—If it is desirable to determine the 3 per cent limit in the soil, portions of the composite solution will have to be concentrated by evaporation according to the above directions so as to contain the percentage of salt given in the table. The cell filled with such concentrated solutions gives a resistance too low to be read on the instrument, and it will be necessary to take a measured amount of the solution in the cell, as, for example, one-fourth or one-fifth its capacity. Determine the resistance and divide it by 4 or 5, as the case may be. This gives the resistance of the cell when filled. For these concentrated solutions the readings will be rather indefinite. Keep the cell electrodes well cleaned at all times.

The irrigation water, or the soil, the electrical resistance of which is to be found, is put into the hard-rubber cell with metal electrodes. If the salt content of water is to be determined, the cell is filled even full with the water. If the salt content of soils is to be determined, the soil is made into the condition of a thin mortar with distilled water and the cell filled with this material, gently tapping the cell on the ground to exclude air bubbles. The top of the soil is then struck off with a knife edge, so that the cell shall be just level full of the saturated soil. The cell is then suspended in the mercury cups attached to the electrolytic bridge and the electrical resistance determined in the following way:

The telephone receiver is pressed against the ear and the handle of the instrument pressed down, when a buzzing sound will be heard in the receiver. Holding the handle down so as to keep the battery switch closed, the pointer is rotated to either right or left until the position is found at which the note in the telephone receiver is no longer heard or is only indistinctly heard. On rotating the pointer to either side of this position, the sound in the receiver should gradu-

ally increase. In case difficulty is found in locating the exact position of balance, it will be found of assistance to rotate the pointer rapidly back and forth over the position of least sound, locating points of equal intensity on either side. The mean position between these two points gives the position of balance, and the number opposite the pointer gives the desired reading.

In case a balance is not obtained with the 1,000-ohm coil of the rotary switch, the 100-ohm and 10-ohm coils should be tried in succession. It is best to choose the coil which will bring the balance as near as possible to the center of the scale, as this is the most sensitive position.

Having obtained the balance, the resistance is found by multiplying the resistance of the comparison coil, as shown by the rotating switch, by the number on the scale opposite the pointer. Thus, if the comparison coil used has a resistance of 100 ohms and the reading on the scale is 0.92, the resistance in the scale is 92 ohms. If the comparison coil is 1,000 ohms and the reading on the scale is 4.5, the resistance would be 4,500 ohms. After taking the resistance in this manner, take the temperature immediately, either of the water or of the saturated soil, by sticking the bulb of a thermometer in and leaving it for some moments. The resistance is then corrected for this temperature according to the directions given below.

Reduction of resistances to a temperature of 60° F.—A single illustration will serve to show the way the following table is used in the reduction of electrical resistances to a uniform temperature of 60° F.: Suppose the observed resistance of the soil is 2,585 ohms at a temperature of 50.5°. In the table, at the temperature of 50.5°, as indicated on the left-hand side, we find that at that temperature 2,000 ohms is equal to 1,748 ohms at 60°; 5,000 ohms is equal to 4,370 ohms at 60°; hence, 500 ohms would be equal to 437 ohms. Similarly, 80 ohms would be one-hundredth of the value given for 8,000 ohms at 50.5° in the table, therefore equal to about 70 ohms at 60°, while the 5 ohms would be equal to about 4 ohms. These separate values are added together thus:

2,000	1,748
500	437
80	70
5	4
2,585 ohms at 50.5°	=2,259 ohms at 60°.

Reduction of the electrical resistance of soils to a uniform temperature of 60° F.

°F.	1000	2000	3000	4000	5000	6000	7000	8000	9000
32.0	625	1,250	1,875	2,500	3,125	3,750	4,375	5,000	5,625
32.5	632	1,264	1,896	2,528	3,150	3,792	4,424	5,056	5,688
33.0	639	1,278	1,917	2,556	3,195	3,834	4,473	5,112	5,751
33.5	646	1,292	1,938	2,584	3,230	3,876	4,522	5,168	5,814
34.0	653	1,306	1,959	2,612	3,265	3,918	4,571	5,224	5,877
34.5	660	1,320	1,980	2,640	3,300	3,960	4,620	5,280	5,940
35.0	667	1,334	2,001	2,668	3,335	4,002	4,669	5,336	6,003
35.5	674	1,348	2,022	2,696	3,370	4,044	4,718	5,392	6,066
36.0	681	1,362	2,043	2,724	3,405	4,086	4,767	5,448	6,129
36.5	688	1,376	2,064	2,752	3,440	4,128	4,816	5,504	6,192
37.0	695	1,390	2,085	2,780	3,475	4,170	4,865	5,560	6,255
37.5	702	1,404	2,106	2,808	3,510	4,212	4,914	5,616	6,318
38.0	709	1,418	2,127	2,836	3,545	4,254	4,963	5,672	6,381
38.5	716	1,432	2,148	2,864	3,580	4,296	5,012	5,728	6,444
39.0	722	1,444	2,166	2,888	3,610	4,332	5,054	5,776	6,498
39.5	729	1,458	2,187	2,916	3,645	4,374	5,103	5,832	6,561
40.0	736	1,472	2,208	2,944	3,680	4,416	5,152	5,888	6,634
40.5	743	1,486	2,229	2,972	3,715	4,458	5,201	5,944	6,687
41.0	750	1,500	2,250	3,000	3,750	4,500	5,250	6,000	6,750
41.5	757	1,514	2,271	3,028	3,785	4,542	5,299	6,056	6,813
42.0	763	1,526	2,289	3,052	3,815	4,578	5,341	6,104	6,867
42.5	770	1,540	2,310	3,080	3,850	4,620	5,390	6,160	6,930
43.0	776	1,552	2,328	3,104	3,880	4,656	5,432	6,208	6,984
43.5	782	1,564	2,346	3,128	3,910	4,692	5,474	6,256	7,038
44.0	788	1,576	2,364	3,152	3,940	4,728	5,516	6,304	7,092
44.5	794	1,588	2,382	3,176	3,970	4,764	5,558	6,352	7,146
45.0	800	1,600	2,400	3,200	4,000	4,800	5,600	6,400	7,200
45.5	807	1,614	2,421	3,228	4,035	4,842	5,649	6,456	7,263
46.0	814	1,628	2,442	3,256	4,070	4,884	5,698	6,512	7,326
46.5	821	1,642	2,463	3,284	4,105	4,926	5,747	6,568	7,389
47.0	828	1,656	2,484	3,312	4,140	4,968	5,796	6,624	7,452
47.5	835	1,670	2,505	3,340	4,175	5,010	5,845	6,680	7,515
48.0	842	1,684	2,526	3,368	4,210	5,052	5,884	6,736	7,578
48.5	849	1,698	2,547	3,396	4,245	5,094	5,933	6,792	7,641
49.0	856	1,712	2,568	3,424	4,280	5,136	5,992	6,848	7,704
49.5	862	1,724	2,586	3,448	4,310	5,172	6,034	6,896	7,758
50.0	868	1,736	2,604	3,472	4,340	5,208	6,076	6,944	7,812
50.5	875	1,750	2,625	3,500	4,375	5,250	6,125	7,000	7,875
51.0	881	1,762	2,643	3,524	4,405	5,286	6,167	7,048	7,929
51.5	887	1,774	2,661	3,548	4,435	5,322	6,209	7,096	7,983
52.0	893	1,786	2,679	3,572	4,465	5,358	6,251	7,144	8,037
52.5	900	1,800	2,700	3,600	4,500	5,400	6,300	7,200	8,100
53.0	906	1,812	2,718	3,624	4,530	5,436	6,342	7,248	8,154
53.5	912	1,824	2,736	3,648	4,560	5,472	6,384	7,296	8,208
54.0	919	1,838	2,757	3,676	4,595	5,514	6,433	7,352	8,271
54.5	926	1,852	2,778	3,704	4,630	5,556	6,482	7,408	8,334

Reduction of the electrical resistance of soils to a uniform temperature of 60° F.—Continued.

°F.	1000	2000	3000	4000	5000	6000	7000	8000	9000
55.0	933	1,866	2,799	3,732	4,665	5,598	6,531	7,464	8,397
55.5	940	1,880	2,820	3,760	4,700	5,640	6,580	7,526	8,460
56.0	947	1,894	2,841	3,780	4,735	5,682	6,629	7,576	8,523
56.5	954	1,908	2,862	3,816	4,770	5,724	6,678	7,632	8,586
57.0	961	1,922	2,883	3,844	4,805	5,766	6,727	7,688	8,649
57.5	968	1,936	2,904	3,872	4,839	5,807	6,775	7,743	8,711
58.0	974	1,948	2,922	3,896	4,870	5,844	6,818	7,792	8,766
58.5	981	1,962	2,943	3,924	4,905	5,886	6,867	7,848	8,829
59.0	987	1,974	2,962	3,949	4,936	5,923	6,910	7,898	8,885
59.5	994	1,988	2,982	3,976	4,971	5,965	6,959	7,953	8,947
60.0	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
60.5	1,006	2,012	3,018	4,024	5,030	6,036	7,042	8,048	9,054
61.0	1,013	2,026	3,039	4,052	5,065	6,078	7,091	8,104	9,117
61.5	1,020	2,040	3,060	4,080	5,100	6,120	7,140	8,160	9,180
62.0	1,027	2,054	3,081	4,108	5,135	6,162	7,189	8,216	9,243
62.5	1,033	2,066	3,099	4,132	5,165	6,198	7,231	8,264	9,297
63.0	1,040	2,080	3,120	4,160	5,200	6,240	7,280	8,320	9,360
63.5	1,047	2,094	3,141	4,188	5,235	6,282	7,329	8,376	9,423
64.0	1,054	2,108	3,162	4,216	5,270	6,324	7,378	8,432	9,486
64.5	1,061	2,122	3,183	4,244	5,305	6,366	7,427	8,488	9,549
65.0	1,068	2,136	3,204	4,272	5,340	6,408	7,476	8,544	9,612
65.5	1,075	2,150	3,225	4,300	5,375	6,450	7,525	8,600	9,675
66.0	1,082	2,164	3,246	4,328	5,410	6,492	7,574	8,656	9,738
66.5	1,089	2,178	3,267	4,356	5,445	6,534	7,623	8,712	9,801
67.0	1,096	2,192	3,288	4,384	5,480	6,576	7,672	8,768	9,864
67.5	1,103	2,206	3,309	4,412	5,515	6,618	7,721	8,824	9,927
68.0	1,110	2,220	3,330	4,440	5,550	6,660	7,770	8,880	9,990
68.5	1,117	2,234	3,351	4,468	5,585	6,702	7,819	8,936	10,053
69.0	1,125	2,250	3,375	4,500	5,625	6,750	7,875	9,000	10,125
69.5	1,133	2,266	3,399	4,532	5,665	6,798	7,931	9,064	10,197
70.0	1,140	2,280	3,420	4,560	5,700	6,840	7,980	9,120	10,260
70.5	1,147	2,294	3,441	4,588	5,735	6,882	8,029	9,176	10,323
71.0	1,155	2,310	3,465	4,620	5,775	6,930	8,085	9,240	10,395
71.5	1,162	2,324	3,486	4,648	5,810	6,972	8,134	9,296	10,458
72.0	1,170	2,340	3,510	4,680	5,850	7,028	8,190	9,360	10,530
72.5	1,177	2,354	3,531	4,708	5,885	7,062	8,239	9,416	10,593
73.0	1,185	2,370	3,555	4,740	5,925	7,110	8,295	9,480	10,665
73.5	1,193	2,386	3,579	4,772	5,965	7,158	8,351	9,544	10,737
74.0	1,201	2,402	3,603	4,804	6,005	7,206	8,407	9,608	40,809
74.5	1,208	2,416	3,624	4,832	6,040	7,248	8,456	9,664	10,872
75.0	1,215	2,430	3,645	4,860	6,075	7,290	8,505	9,720	10,935
75.5	1,222	2,444	3,666	4,888	6,110	7,332	8,554	9,776	10,998
76.0	1,230	2,460	3,690	4,920	6,158	7,380	8,610	9,840	11,070
76.5	1,238	2,476	3,714	4,952	6,190	7,428	8,666	9,904	11,142
77.0	1,246	2,492	3,738	4,984	6,230	7,476	8,722	9,968	11,214
77.5	1,254	2,508	3,762	5,016	6,270	7,524	8,778	10,032	11,286

Reduction of the electrical resistance of soils to a uniform temperature of 60° F.—Continued.

°F.	1000	2000	3000	4000	5000	6000	7000	8000	9000
78.0	1,262	2,524	3,786	5,048	6,310	7,572	8,834	10,096	11,358
78.5	1,270	2,540	3,810	5,080	6,350	7,620	8,890	10,160	11,430
79.0	1,278	2,556	3,834	5,112	6,390	7,668	8,946	10,224	11,502
79.5	1,286	2,572	3,858	5,144	6,430	7,716	9,002	10,288	11,574
80.0	1,294	2,588	3,882	5,176	6,470	7,754	9,058	10,352	11,646
80.5	1,302	2,604	3,906	5,208	6,510	7,812	9,114	10,416	11,718
81.0	1,310	2,620	3,930	5,240	6,550	7,860	9,170	10,480	11,790
81.5	1,318	2,636	3,954	5,272	6,590	7,908	9,226	10,544	11,862
82.0	1,327	2,654	3,981	5,308	6,635	7,962	9,289	10,616	11,943
82.5	1,335	2,670	4,005	5,340	6,675	8,010	9,345	10,680	12,015
83.0	1,343	2,686	4,029	5,372	6,715	8,058	9,401	10,744	12,087
83.5	1,351	2,702	4,053	5,404	6,755	8,106	9,457	10,808	12,159
84.0	1,359	2,718	4,077	5,436	6,795	8,154	9,513	10,872	12,231
84.5	1,367	2,734	4,101	5,468	6,835	8,202	9,569	10,936	12,303
85.0	1,376	2,752	4,128	5,504	6,880	8,256	9,632	11,008	12,384
85.5	1,385	2,770	4,155	5,540	6,925	8,310	9,695	11,080	12,465
86.0	1,393	2,786	4,179	5,572	6,965	8,358	9,751	11,144	12,537
86.5	1,401	2,802	4,203	5,604	7,005	8,406	9,807	11,208	12,609
87.0	1,409	2,818	4,227	5,636	7,045	8,454	9,863	11,272	12,681
87.5	1,418	2,836	4,254	5,672	7,090	8,508	9,931	11,344	12,762
88.0	1,427	2,854	4,281	5,708	7,135	8,562	9,989	11,416	12,843
88.5	1,435	2,870	4,305	5,740	7,175	8,610	10,040	11,480	12,915
89.0	1,443	2,886	4,329	5,772	7,215	8,658	10,091	11,544	12,987
89.5	1,451	2,902	4,353	5,804	7,255	8,706	10,157	11,608	13,059
90.0	1,460	2,920	4,380	5,840	7,300	8,760	10,220	11,680	13,140
90.5	1,468	2,936	4,404	5,872	7,340	8,808	10,276	11,744	13,212
91.0	1,477	2,954	4,431	5,908	7,385	8,862	10,339	11,816	13,293
91.5	1,486	2,972	4,458	5,944	7,430	8,916	10,402	11,888	13,374
92.0	1,495	2,990	4,485	5,980	7,475	8,970	10,465	11,960	13,455
92.5	1,504	3,008	4,512	6,016	7,520	9,024	10,528	12,032	13,536
93.0	1,513	3,026	4,539	6,052	7,565	9,078	10,591	12,104	13,617
93.5	1,522	3,044	4,566	6,088	7,610	9,132	10,654	12,176	13,698
94.0	1,531	3,062	4,593	6,124	7,655	9,186	10,717	12,248	13,779
94.5	1,540	3,080	4,620	6,160	7,700	9,240	10,780	12,320	13,860
95.0	1,549	3,098	4,647	6,196	7,745	9,294	10,843	12,392	13,941
95.5	1,559	3,118	4,677	6,236	7,795	9,354	10,913	12,472	14,031
96.0	1,569	3,138	4,707	6,276	7,845	9,414	10,983	12,552	14,121
96.5	1,579	3,158	4,737	6,316	7,895	9,474	11,053	12,632	14,211
97.0	1,589	3,178	4,767	6,356	7,945	9,534	11,123	12,712	14,301
97.5	1,599	3,198	4,797	6,396	7,995	9,594	11,193	12,792	14,391
98.0	1,609	3,218	4,827	6,436	8,045	9,654	11,263	12,872	14,481
98.5	1,619	3,238	4,857	6,476	8,095	9,714	11,333	12,952	14,571
99.0	1,629	3,258	4,887	6,516	8,145	9,774	11,403	13,032	14,661

Directions for estimating soluble salts in soils.—Take a known volume (or weight) of saturated soil, wash into a 250 cc. flask and fill to the mark with distilled water, and filter if necessary. Take 50 cc. of the solution and titrate with N/20 acid potassium sulphate, containing 6.758 grams per liter, using phenolpthalein as an indicator. This will represent the carbonates. Then add a drop or so of methyl orange or congo red and again titrate with N/20 acid potassium sulphate. Subtract an amount equal to the first titration from the second, and the difference represents the bicarbonates. Add a few drops of potassium chromate as an indicator to the same solution and titrate with N/10 silver nitrate. This will represent the chlorides. The salts are all to be estimated as sodium salts, as follows:

1 c. c. N/20 $HKSO_4$ is equivalent to 0.005266 gram Na_2CO_3.
1 c. c. N/20 $HKSO_4$ is equivalent to 0.004172 gram $NaHCO_3$.
1 c. c. N/10 $AgNO_3$ is equivalent to 0.005806 gram NaCl.

In areas where the amount and distribution of sodium carbonate warrant it, construct the sodium carbonate map in the field from the volume of solution used. Limiting values will be 0.3, 0.2, 0.1, and 0.05 per cent of dry soil. The limiting values for each vessel are found in the following way: Multiply the volume of saturated soil, represented by the solution taken for titration, by the numbers in the following table:

Na_2CO_3 in soil.	s. and ssc.	sc.	scc.	c. and hc.
Per cent.				
0.30	0.832	0.752	0.720	0.689
.20	.554	.502	.480	.459
.10	.277	.251	.240	.230
.05	.138	.125	.120	.115

These results so obtained are the cubic centimeters of N/10 solution of sodium carbonate corresponding to the limiting values, to be inserted in the following table:

Na_2CO_3 in soil.	s. and ssc.	sc.	scc.	c. and hc.
Per cent.	*cc.*	*cc.*	*cc.*	*cc.*
0.30	.....	.....	.....	.....
.20	.....	.....	.....	.....
.10	.....	.....	.....	.....
.05	.....	.....	.....	.....

If it is desired to reduce the volume of N/10 $AgNO_3$ to per cent of NaCl in dry soil, the following formula may be used:

$$\frac{V\ 0.005806}{V'\ K}$$

Substituting 0.004172 for 0.005806, the same formula may be used to reduce the volume of N/20 $HKSO_4$ to per cent of $NaHCO_3$. V=cubic centimeters N/10 $AgNO_3$ or N/20 $HKSO_4$ solution used; V′=volume saturated soil represented in amount of solution titrated; K=constant for type of soil as follows:

s. and ssc.=1.46; sc.=1.32; scc.=1.26; c. and hc.=1.21.

Construction of alkali maps.—The directions for mapping alkali soils in the field, just given, which are also to be found in the front of the Alkali Field Book, will enable you to determine the percentage of alkali in any sample of soil. It has been the practice of this Bureau to prepare maps showing the percentage of alkali in the surface 6 feet of soil. This has generally been considered to be a mathematical average of the salt content of the 6 feet; but in nearly all cases the judgment of the person in charge of the work as to the actual crop value of the soil on the basis of alfalfa has entered into the construction of the maps.

To do away as much as possible with this element of judgment and to place the construction of the maps entirely upon a percentage basis—that they may be of equal value when any crop is considered—and to permit the strict comparison of the work done by different men, the following plan is to be adopted:

The percentage of alkali salts in each foot of land to a depth of 6 feet will be determined according to the directions in the front of the

Alkali Field Book. In many cases after the observer becomes familiar with the soils of a locality, the field work may be very much shortened by making the alkali determinations in alternate foot sections or by mixing 2 or more feet for one salt determination.

The percentage of alkali, as indicated by the various colors upon the alkali map, is to be a mathematical average of the alkali in the foot sections. In case there should be a marked accumulation of the alkali at any one part of the vertical section, such as the surface of the ground or in an alkali hardpan, the judgment of the observer is to decide whether the strict mathematical average should be followed or whether the soil is to be mapped as of the next higher grade of alkali content. If these areas, where there is a zone of accumulation of the alkali such as an accumulation at the surface, are of considerable extent, they are to be indicated upon the field map by special rulings in lead pencil, and when the field maps are published the rulings will be described in the legend of the map. Thus, if a soil contain on an average 0.2 per cent of alkali, but has an accumulation of 0.5 per cent of alkali on the surface, this soil should be colored to show 0.2 per cent alkali, and the fact that there is a surface accumulation should be indicated by black rulings across the area affected. If the accumulation is below the surface foot another kind of ruling can be used to indicate that fact. Appropriate lettering upon the maps will render these rulings intelligible.

Determination of salts in water.—Fill the electrolytic cell with water and take the resistance. Take the temperature with an ordinary thermometer, and reduce to 60° F. by use of the tables on pages 26, 27, and 28. The salt content corresponding to this resistance may be found from the following table compiled by Mr. Seidell from a large number of laboratory determinations. The curve varies with the character of salts present. Where no carbonates are present in the water, the figures in the column marked "Chlorides" should be used. Where the percentage of carbonates is high (more than 50 per cent from a preliminary estimate of the total salt content), the figures in the column marked "Carbonates" should be used. For intermediate percentages of carbonates a corresponding intermediate value between that given in the two columns should be used.

Table for determining total salt content of water from resistance at 60° F.

Resistance 60° F.	Chlorides.	Carbonates.	Resistance 60° F.	Chlorides.	Carbonates.	Resistance 60° F.	Chlorides.	Carbonates.
30	750		140	141	200	340	50	71
35	670		150	132	187	360	47	65
40	595		160	124	176	380	44	60
45	525		170	116	165	400	41	55
50	460	460	180	109	154	450	35	46
55	400	425	190	102	144	500	31	38
60	355	395	200	95	138	550	28	32
65	305	375	210	91	130	600	25	27
70	265	355	220	87	122	700	22	23
75	230	335	230	83	116	800	20	
80	213	320	240	79	110	900	19	
85	203	306	250	75	105	1,000	18	
90	195	294	260	71	100	1,200	17	
95	188	284	270	68	95	1,400	16	
100	181	262	280	65	90	1,600	16	
110	170	250	290	62	86	1,800	15	
120	160	231	300	59	83	2,000	15	
130	150	213	320	54	77	.....	.....	

When samples of water are examined in the field by the chemical methods described on the preceding page, the following table will assist in the calculation of parts per 100,000 of Na_2CO_3, $NaHCO_3$, and NaCl. Fifty cubic centimeters of water should be used in making the titrations.

C. c. $\frac{N}{20}KHSO_4$ or $\frac{N}{20}AgNO_3$	Parts per 100,000 of water.		
	Na_2CO_3.	$NaHCO_3$.	NaCl.
1.....	10.532	8.344	11.612
2.....	21.06	16.69	23.22
3.....	31.60	25.03	34.84
4.....	42.13	33.38	46.45
5.....	52.66	41.72	58.06
6.....	63.19	50.06	69.67
7.....	73.72	58.41	81.28
8.....	84.26	66.75	92.89
9.....	94.79	75.10	104.51

The electrolytic cells are made as nearly of the same dimensions as possible, but if there is much variation in either volume or shape this table must not be used without a correction for the cell.

If greater accuracy is desired than can be expected by the use of the above table, proceed in the following way:

Collect 6 or 8 samples of water from different parts of the area; determine the electrical resistance of each, and take an amount of each proportional to the resistance, mixing them in a clean vessel. There should be at least 2 quarts, and preferably 1 gallon, of this mixture. Evaporate slowly on a stove until the mixture is about as strong as the strongest water likely to be encountered. If there is any possibility of encountering water as strong as a 1 per cent solution—that is, 1,000 parts of salts in 100,000 parts of water—the mixture should be evaporated until it gives a resistance in the cell of about 23 ohms. The amount of this evaporation can be determined by the original resistance of the mixture. If the resistance of the mixture is 100 ohms, it should be evaporated to one-fourth its volume to make approximately a 1 per cent solution. If the resistance is 400 ohms, the solution should be evaporated to one twenty-third of its original volume. Water having a resistance of 400 ohms would have a salt content according to the above table of about 44 in 100,000, and would be considered an excellent water for irrigation purposes. It would require 3 gallons of such water, evaporated to 1 pint, to make a 1 per cent solution.

To determine the actual per cent of salt in this solution, after finding the resistance in a cell, evaporate in a weighed vessel—such as a tin cup or a tin can—a separate, weighed amount of the water. Weigh the vessel again after the evaporation, and this will give the amount of residue in a known weight of water. The weighing should be carefully done on reliable druggists' scales.

Take the concentrated solution and dilute with successive quantities of distilled water, so as to change the concentration of the solution and get the corresponding resistances in the cell. Use, for example, 9 parts of the solution and 1 part distilled water, then 8 parts of the solution and 2 parts of distilled water, and so on down to any dilution likely to be encountered. This will give the resistance corresponding very exactly with known amounts of salt, and will furnish a table for the estimation of the salt content from the resistance of any water in the area.

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The table constructed from this data can be used directly by interpolation, or preferably a curve should be constructed and any intermediate points picked out from this.

Form of a soil-survey report.—Owing to the large amount of data being collected by the soil-survey parties, it will be necessary to confine the report from each party to about 50 typewritten pages of 250 words each or 25 printed pages of 500 words each for the Western Division and to about 15 or 20 printed pages for the Eastern Division. The material for the report should be collected and written up, so far as possible, before the party leaves the field.

An outline of the chapters is given as a guide in the arrangement of the report, and should be followed as closely as circumstances will permit. The number of words to be given in each chapter will be a guide in the preparation of the material and is given as the result of experience in former reports. It is understood of course that the headings will necessarily have to be changed somewhat in different districts, and the relative importance of the different chapters will vary with the locality. This is intended, therefore, simply as a guide in the preparation of the reports, and the number of words should be taken as the maximum to be used except in the case of matters of special importance, which may need fuller treatment.

The matter should be presented in a terse style, and no more words used than are absolutely necessary to convey the meaning, being careful, however, to treat each subject so that all important phases may be brought out and clearly stated. In order to attain this, the different chapters should be revised several times if necessary, so that all important matters may be considered and all unnecessary words eliminated. A careful consideration of this matter of style in writing is enjoined upon all members of the division charged with the preparation of reports.

Outline of soil-survey report.—The outline of chapters referred to is as follows:

I. Location and Boundaries of the Area (250 words).
II. History of Settlement and Agricultural Development (750 words).
III. Climate.
IV. Physiography and Geology (1,000 words).
V. Soils (500 words to each type).
    Name, description, and depth of soil and subsoil.
    Location of soil in area.

V. Soils (500 words to each type)—Continued.
Physiography.
Drainage features.
Origin of soil and processes of formation.
Important mineral or chemical features. Alkali salts.
Crops grown and average yields.
Crops to which adapted.
VI. Special Soil Problems, such as Hardpan, Acid Soils (1,000 words).
VII. Water Supply for Irrigation, Amount and Character (1,000 words).
VIII. Underground and Seepage Waters, Drainage of Soils (1,000 words).
IX. Alkali in Soils (2,000 words).
Location of alkali areas.
Origin of alkali.
Chemical composition of alkali.
Distribution in soil.
X. Reclamation of Swamp, Worn-out Lands, or Alkali Lands (1,000 words).
XI. Agricultural Methods in Use, Cultivation, Cropping, Rotation, Irrigation, etc.
XII. Agricultural Conditions in the Area (2,000 words).
General prosperity of farming class.
Tenure of farms.
General size of farms.
Character and efficiency of labor.
Character of principal products.
Recognition of adaptation of soils to crops.
Transportation facilities.
Markets.

In preparing Chapters V, IX, and XII, write in the subtopics and discuss each in the order given. This will aid in securing uniformity in the reports, and prevent the omission of matter important in making comparisons of the soils and conditions in different areas.

SOIL TYPES RECOGNIZED BY THE BUREAU OF SOILS.

[For convenience in comparing soils the mechanical analyses have been recalculated and given in four grades, as follows: (1) Fine gravel and coarse sand; (2) medium, fine, and very fine sand; (3) silt; (4) clay. Or, in other words, the materials have been graded into coarse and medium to fine particles, silt, and clay. It is understood that the analyses all refer to fine earth.]

STONY LOAM.

Alton stony loam.—A grayish or brown silty or sandy loam, 6 to 10 inches deep, containing 25 to 70 per cent of stones and gravel. The subsoil is either a sandy loam of brown color or a clayey sandy loam of reddish color, containing 20 to 70 per cent of granite, sandstone,

and limestone fragments. Occupies the rolling and level uplands; fairly well drained. Derived through weathering of glacial material. A poor soil. Beans, corn, wheat, oats, and grasses are the main products. Truck and fruit do fairly well.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	7.56	49.89	29.67	12.55
Subsoil	3	5.71	41.17	30.65	19.23

	Acres.
Lyons sheet, New York	38,208

Cecil stony loam.—Soil is derived from the weathering of intrusive dikes of fine-grained trap (diabase) rock. It occupies small, isolated patches and strips near the eastern foot of the Appalachian Mountains. The soil consists of 12 inches of red loam mixed with 30 to 60 per cent of rounded "iron-stone" bowlders. The subsoil is a heavy clay loam also containing bowlders. This soil produces good crops when cleared of stone, but does not occupy large or important areas.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	7.56	27.53	46.16	12.60
Subsoil	2	7.39	32.54	36.19	18.91

	Acres.
Lancaster County sheet, Pennsylvania (mapped as Hempfield stony loam)	1,400
Lancaster County sheet, Pennsylvania (mapped as Manor stony loam)	3,500
Lebanon sheet, Pennsylvania	22,500

Clarksville stony loam.—Light yellow silty loam 6 inches in depth, overlying heavy yellowish-red clay 3 feet or more in depth. Both soil and subsoil contain 20 to 50 per cent of angular fragments of chert. Rough, broken country, with deep-cut, narrow valleys. Residual soil derived from cherty limestone. High, well-drained country, originally heavily forested with oak and chestnut. Soils

are thin and stony and of little agricultural value, and at present largely covered with thick second growth of oak timber. Adapted to apples and peaches.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	4.79	12.73	67.88	13.67
Subsoil	9	5.31	14.63	53.40	25.65

	Acres.
Clarksville sheet, Tennessee	66,450
Dubuque sheet, Iowa	60,672
Howell County sheet, Missouri	499,264
Wichita sheet, Kansas	4,352

Edgemont stony loam.—This soil is derived from the weathering of fine-grained siliceous sandstones or quartzites, typically found along the eastern slopes of the Appalachian Mountains. The soil consists of a thin layer of sandy loam, more or less stony, which grades into a loose mass of sandstones and slates. The surface is strewn with 30 to 60 per cent of angular pieces of flat, flaggy sandstone. The soil is not strong or productive, but fruit grown upon it is of superior beauty and flavor. The mountain peach industry of Maryland has been developed on this type.

The greater part of the ridges is covered with chestnut, locust, and oak timber; besides, fruits, corn, oats, rye, and potatoes are grown to a limited extent. Wheat produces a small crop of bright, heavy grain

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	16.46	35.68	27.65	19.98
Subsoil	5	15.81	32.99	25.20	25.41

	Acres.
Buckingham sheet, Virginia	9,472
Harrisonburg sheet, Virginia	75,136
Lancaster County sheet, Pennsylvania	13,000
Lebanon sheet, Pennsylvania	20,300
Waynesboro sheet, Virginia	50,048

Garner stony loam.—A sandy loam containing 40 to 60 per cent of rock fragments and gravel, mainly iron-stained sandstone. At a depth of 6 to 15 inches it overlies a red, tenacious brick-clay subsoil, which also contains sand, gravel, and stones. It is found along stream courses and probably owes its origin to stream action at times of overflow. Tillage is difficult, but fair crops of cotton can be raised. It is devoted to the growth of commercial pine timber and used for hog and cattle pastures.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	38.62	35.66	14.07	7.39
Subsoil	1	10.30	14.53	22.37	45.91

	Acres.
Clayton sheet, North Carolina	13,350
Princeton sheet, North Carolina	980

Hagerstown stony loam.—A fine sandy loam to fine loam, 8 inches deep, brown or light gray to yellowish in color. Subsoil a yellowish-red clay loam to a stiff red clay. Soil and subsoil contain angular fragments of cherty material. Occupies valleys and rolling uplands. Drainage good. Derived from weathering of impure or cherty limestones. Wheat and corn principal crops, but type thought to be adapted to fruit, especially apples.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	8.18	18.99	51.78	20.57
Subsoil	3	5.64	11.17	35.47	48.33

	Acres.
Bedford County sheet, Virginia (mapped as Murrill stony loam)	11,950
Harrisonburg sheet, Virginia	47,552
Waynesboro sheet, Virginia	11,584

Holyoke stony loam.—This soil is of glacial origin, and consists of about 3 feet of loam, containing 10 to 50 per cent of diabase and other bowlders. The areas occupied are rough and mountainous, occurring along the base of diabase ranges. The soil is chiefly devoted to pasture, though it is used also to some extent for fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	23.12	25.61	30.10	4.84
Subsoil	1	15.12	41.35	27.71	12.20

	Acres.
Hartford sheet, Connecticut	19,730

Maricopa stony loam.—Sandy loam, 4 to 6 feet deep, containing stones and bowlders, underlain by bed rock and masses of bowlders. These often project above the surface. Lower slopes of the mountains, Salt Lake and Weber counties, Utah. Has no agricultural value at present, being too stony, and besides usually lying too high for irrigation. But for this disadvantage of position in most areas, and the scarcity of water in others, some part of this soil might be used in fruit growing.

	Acres.
Salt Lake sheet, Utah (mapped as Bingham stony loam)	16,600
Sevier Valley sheet, Utah (mapped as Bingham stony loam)	4,210
Weber County sheet, Utah (mapped as Bingham stony loam)	5,700

Miami stony loam.—Ten inches of silty loam, underlain by heavy red clay slightly silty to a depth of 30 inches, in turn underlain by beds of consolidated gravel. From 20 to 60 per cent of rounded and angular stones on the surface and mixed with both soil and subsoil. Stones vary from 1 to 8 inches in diameter. Surface generally consists of large rounded hills and tablelands and of gently rolling lands at lower levels. Chiefly derived from morainic material. Soil is very productive. Good crops of corn, wheat, grass, oats, and fruit, particularly apples, are grown. This type also affords excellent pasture.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	11.43	27.63	47.49	11.17
Subsoil	6	23.30	27.35	33.56	13.15

	Acres.
Allegan County sheet, Michigan (mapped as Allegan stony loam)	76,790
Lyons sheet, New York	158,400

Penn stony loam.—Very stony land, hilly to mountainous in character, and generally covered with a natural forest of chestnut and oak. It consists of a rather heavy Indian red loam, 8 to 10 inches deep, containing from 30 to 60 per cent of red or brown sandstone fragments. The subsoil is of much the same character to a great depth. This type is derived from the more siliceous or hardened phase of the Triassic sandstone. It is well adapted to forestry and orcharding, and the more level areas, when the stones are removed, to general farm crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	20.39	29.43	31.85	15.88
Subsoil	2	20.13	25.77	31.08	21.25

	Acres.
Lebanon sheet, Pennsylvania	49,160
Trenton sheet, New Jersey	5,632

Plainwell stony loam.—Loose yellow sandy loam, 8 inches deep, underlain by loose yellow medium and fine sand to a depth of 3 feet or more. From 20 to 70 per cent of stones and large bowlders scattered on the surface and mixed with the soil and subsoil. Large rounded hills and ridges. Derived from morainic material. Corn, rye, and buckwheat are grown to some extent, but the yields of these crops are low.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	30.90	53.02	9.26	4.73
Subsoil	1	29.68	52.54	9.82	5.89

Acres.

Allegan County sheet, Michigan 4,150

Porters stony loam.—Grayish-yellow sandy loam, 10 inches deep, mixed with fragments of sandstone and other rocks. Subsoil grades from reddish-brown clay loam to a stiff red clay in lower depths, and contains some coarse sand and a large percentage of sandstone fragments. Rolling valley lands and gentle slopes of mountains. Soil is colluvial, derived from wash from mountains, but subsoil is derived from decomposition of underlying rocks: Produces good crops—wheat, corn, grass, tobacco, rye, and apples.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	23.35	29.83	28.91	14.15
Subsoil	7	17.04	24.20	27.26	26.12

Acres.

Alamance County sheet, North Carolina (mapped as Herndon stony loam) 4,960
Cobb County sheet, Georgia (mapped as Herndon stony loam).. 2,020
Hickory sheet, North Carolina 2,624
Statesville sheet, North Carolina (mapped as Herndon stony loam)..... 8,130
Taylorsville sheet, North Carolina 22,528

Portugues stony loam.—Dark loam 14 inches in depth, derived from igneous and volcanic rocks. Contains 5 to 70 per cent of angular stones, and is underlain by cracked and broken volcanic and igneous rock partly decomposed. Occupies steep slopes of hills and mountains, covering a large area between Ponce and Adjuntas. Used for pasture during the rainy season. Some coffee, bananas, and plantains are produced on favored areas.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	2	33.11	20.22	24.16	18.41

	Acres.
Arecibo sheet, Porto Rico	15,600

Rock outcrop.—Areas in the main either rock outcrop or so stony as to be entirely unfit for cultivation.

	Acres.
Mount Mitchell sheet, North Carolina	5,184
Bedford sheet, Virginia	17,140

Tanama stony loam.—Soil is a red clay loam, 6 to 10 inches deep, derived from limestone. Occupies large area of broken and rugged country between Arecibo and Utuado, characterized by local, swampy sink holes. Subsoil is a stiff red clay containing limestone fragments. Bananas and plantains are the principal crops, and some coffee, oranges, and a little tobacco are produced.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	6.23	17.63	31.23	44.16
Subsoil	2	11.72	32.19	15.37	39.97

	Acres.
Arecibo sheet, Porto Rico	41,680

Triassic stony loam.—A red sandy loam containing 10 to 40 per cent of gravel and bowlders of all sizes and shapes. This soil occurs on hills of glacial material scattered through the late sedimentary deposits of the Connecticut Valley and forming the lower slopes of the valley walls. Havana seed tobacco is raised on this soil, and it also produces good general farm crops. This name will not be used outside the Connecticut Valley. In other areas these soils will be known as the Penn stony loam.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Subsoil	3	28.33	45.86	13.81	9.22

	Acres.
Hartford sheet, Connecticut and Massachusetts	37,180

Yakima stony loam.—Basaltic bowlders and outcroppings in too great quantity to permit of cultivation. Spaces between bowlders occupied by small patches of Yakima sandy loam. Occurs on hillsides and plateaus in valleys. Well drained and free from alkali.

	Acres.
Sunnyside sheet, Washington	2,370
Yakima sheet, Washington	6,590

GRAVEL.

Arroyo Seco sandy loam.—Dark-brown or yellowish coarse sandy loam containing a large percentage of coarse, well-rounded gravel and small bowlders of granitic origin. Sometimes becoming compact and very hard at surface. Found upon gently sloping fans. Derived from stream wash from mountains. Somewhat deficient in organic matter. Adapted to grains if well irrigated, but irrigation is very difficult on account of loss by seepage through coarse subsoil. Yield fair in favorable seasons. Free from alkali.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	25.84	45.36	18.96	7.53

	Acres.
Soledad sheet, California	9,570

Dunkirk gravel.—Very gravelly soil of old lake beaches, occurring in narrow bands between the lake and uplands. Waterworn fragments of shale, 6 feet or more deep. At present used extensively for grape culture, but grapes do not keep so well or bear shipment so well as those grown on Dunkirk clay. Soil is quite droughty and not well suited to other crops.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	37.66	9.12	33.76	16.46

	Acres.
Westfield sheet, New York	4,840

Mackinaw gravel.—A medium grade sandy loam 0 to 12 inches deep, containing 50 per cent gravel from one-half inch to 2 inches in diameter. Has a subsoil of cross-bedded sand and gravel, the latter coated with calcium carbonate. Occurs only in small areas and is the outcrop of reworked glacial gravels in river cliffs. For the most part uncultivated. Adapted to the growth of grapes and peaches. Slight value for general farming.

	Acres.
Janesville sheet, Wisconsin	9,924
Tazewell County sheet, Illinois	1,088

Pecos conglomerate.—Sandy loam to a depth of 2 feet, containing a high percentage of rounded gravel, resting upon conglomerate or gravel beds. Bench land and bluffs. Soil derived from disintegration of conglomerate beds; well drained and free from alkali salts; readily transmits seepage waters. Not adapted to any agricultural purpose at present.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	2	6.04	55.49	16.98	17.72

	Acres.
Carlsbad sheet, New Mexico	11,680

Riverwash.—Coarse sand and bowlders, generally in long, narrow areas; subject to overflow in times of flood; occupying bottoms of river channels. No agricultural value.

	Acres.
Arecibo sheet, Porto Rico	970
Fresno sheet, California	480
Holly sheet, Colorado	4,096
Lamar sheet, Colorado	3,008
Las Animas sheet, Colorado	3,264
Rockyford sheet, Colorado	2,432
Salinas sheet, California	3,170
San Grabriel sheet, California	16,230
Sevier Valley sheet, Utah (mapped as Elsinore sand)	1,900
Sevier Valley sheet, Utah	1,300
Soledad sheet, California	7,590
Ventura sheet, California	13,610
Yakima sheet, Washington	3,580

Salt River gravel.—Coarse gravel of undetermined depth. Bluff along Salt River, Arizona. Of no present agricultural value.

	Acres.
Salt River Valley sheet, Arizona	1,804

Susquehanna gravel.—Hills and narrow bands of gravel along Atlantic seaboard. The soil is gray loam about 12 inches deep, containing 30 to 60 per cent of rounded white quartz gravel. The subsoil varies, but is usually clay or gravel beds. Formed from denudation of gravel layers deposited as shallow-water sediment or as river wash or delta. Is a poor, unproductive soil, lying on slopes, and should be reforested.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	33.00	25.79	24.67	13.23
Subsoil	2	44.91	18.56	23.48	11.79

	Acres.
Calvert County sheet, Maryland	3,900
Cecil County sheet, Maryland	45,600
Clayton sheet, North Carolina	8,030
Harford County sheet, Maryland	12,930
Kent County sheet, Maryland	12,490
Prince George County sheet, Maryland	41,470
Princeton sheet, North Carolina	3,380
St. Mary County sheet, Maryland	7,350
Trenton sheet, New Jersey	192

GRAVELLY LOAM.

Allegan gravelly loam.—Soil to depth of 9 inches consists of sandy, gravelly loam, usually underlain to a depth of several feet by a ferruginous gravel hardpan. Gravel content varies from 25 to 60 per cent. Gravel ranges in diameter from one-half inch to 6 inches. Derived from glacial material, and usually occurs as ridges or knolls. Peaches, pears, cherries, plums, apples, and small fruits are grown to a considerable extent. Also used for general farming, and good crops of corn, wheat, and grass are produced.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	55.64	26.98	9.72	4.40
Subsoil	1	60.32	23.92	7.48	6.65

	Acres.
Allegan County sheet, Michigan	4,810

Billings gravelly loam.—A sandy loam 0 to 18 inches deep, underlain by loam or light clay loam 3 feet deep, both containing gravel, beneath which is found waterworn gravel. Found in terraces which were formerly river banks. Is free from alkali and well drained. Where occurring on plateau is well adapted to grain and alfalfa.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	2	6.86	31.14	35.95	25.76

	Acres.
Billings sheet, Montana	11,776

Chicopee gravel loam.—A coarse sandy loam, containing 20 to 40 per cent of rounded white quartz gravel from one-half inch to 2 inches in diameter. Occupies level plains in recent sedimentary deposits. It represents the shallow-water contributions of swiftly flowing lateral streams of large size. Has no present agricultural

value. This name will not be used outside the Connecticut Valley. Hereafter similar soils will be classed as Susquehanna gravelly loam.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	45.13	37.65	9.48	3.49

	Acres.
Hartford sheet, Connecticut and Massachusetts	10,900

Donegal gravelly loam.—Occurs as poorly marked river terraces along the lower course of the Susquehanna River. Sandy loam 12 inches deep with rounded river gravel seldom exceeding 30 per cent, underlain by same material slightly more gravelly. Deposited by the river when swelled by large volume of water from melting glacial ice to the north, which carried with it sands and gravels of glacially derived materials. Adapted to market gardening and wrapper tobacco. Too light for general agriculture.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	14.39	40.63	32.62	9.11
Subsoil	5	15.76	43.58	27.10	9.25

	Acres.
Lancaster County sheet, Pennsylvania	4,000
Lebanon sheet, Pennsylvania	13,350

Dunkirk gravelly loam.—A sandy loam containing from 40 to 60 per cent of very fine gravel, which consists of waterworn fragments of shale. The soil is underlain at about 3 feet by shale fragments or sand. Occurs in bands along foot of low ridges on lake forelands and also upon uplands. Has the characteristics of an ancient beach or bar and was probably derived from deposition by water. Sometimes has larger gravel scattered over the surface. It is a well-drained early soil, adapted to market-garden and truck crops. It is not well suited for most general farming crops, but is a typical corn soil. Grapes are successfully grown.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	43.99	17.29	22.45	10.87
Subsoil	3	49.34	18.14	19.11	10.13

	Acres.
Westfield sheet, New York	7,260

Fargo gravelly loam.—A black sandy loam 6 inches deep, containing small gravel, underlain to a depth of 2 feet by a gritty black or gray loam, in turn resting on a gritty, stiff, mottled gray and yellow clay loam or clay, containing small gravel and concretions or iron oxide. Occupies swales between the beaches and former estuaries of an ancient lake. Is poorly drained, and subsoil contains considerable alkali. Owes origin to lacustrine deposits. Wheat, oats, barley, flax, corn, principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	12.71	29.40	38.56	18.77
Subsoil	4	14.72	25.78	35.43	23.61

	Acres.
Grand Forks sheet, North Dakota	51,136

Kalamazoo gravelly loam.—Eight inches of coarse sand mixed with fine waterworn gravel, underlain by coarse sand containing slightly increased amount of fine gravel to a depth of 3 feet or more. Gravel content varies from 5 to 20 per cent in soil and from 10 to 25 per cent in subsoil. Gravel rarely exceeds 1 inch in diameter. Gently rolling uplands and well-defined river terraces. Derived from glacial material considerably modified by water action. Porous soil, well drained; generally considered too light for best results for general farm crops, such as corn, wheat, and grass, but used to slight extent for truck, peaches, and cherries.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	58.25	28.17	6.71	4.49
Subsoil	2	55.41	31.74	6.64	4.84

	Acres.
Allegan County sheet, Michigan	14,160

Leonardtown gravelly loam.—Gravelly loam containing from 15 to 30 per cent of fine and medium gravel with some sand. Average depth, 9 inches, underlain by compact yellow loam mingled with sand and gravel, in turn underlain at a depth of 30 inches by gravel and sand. Distinguished from Susquehanna gravel by larger proportion of fine earth, and from Sassafras gravelly loam by heavier and deeper subsoil. Surface rolling. Best adapted to corn, but good for wheat, grass, and truck.

	Acres.
Prince George County sheet, Maryland	3,710

Maricopa gravelly loam.—Sandy loam, 6 feet or more in depth, containing gravel within 3 feet or less of the surface; always well drained. Gravel usually from one-half inch to 1½ inches in diameter, generally increasing in amount in lower depths. High bench lands and sloping valley floors in narrow valleys. When too high for irrigation this soil is used to some extent for dry farming to wheat; when irrigated it forms desirable land for alfalfa, grain, and fruit. In California fruit is grown on this soil without irrigation. Considerable seepage from canals.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	19	18.19	40.13	24.50	11.80
Subsoil	8	12.47	42.88	27.36	11.96

	Acres.
Salt Lake sheet, Utah (mapped as Bingham gravelly loam)	35,280
Salt River Valley (Tempe and Phoenix sheets), Arizona	51,066
San Gabriel sheet, California (mapped as San Gabriel gravelly loam)	15,360
Sevier Valley sheet, Utah (mapped as Bingham gravelly loam)	38,400
Ventura sheet, California (mapped as San Gabriel gravelly loam)	4,310

Miami gravelly loam.—Brown or reddish loam, 12 inches deep, with 15 to 30 per cent of rounded gravel, underlain to a depth of 24 inches by a stiff, tenacious clay loam, which is in turn underlain by a layer of gravel. Level or gently rolling river terraces. Originally glacial material, worked over by the streams. Recognized as fine land for general farm purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	22.85	23.42	34.16	15.52
Subsoil	4	26.03	20.18	32.39	22.83

	Acres.
Bigflats sheet, New York	15,680
Columbus sheet, Ohio	18,944
Montgomery County sheet, Ohio	24,000

Sassafras gravelly loam.—Occupies sloping upland areas along northern Atlantic coast. The soil is a brown gravelly loam containing 15 to 35 per cent of round quartz gravel from one-half inch to 2 inches in diameter. The subsoil consists of a red gravelly loam resting on a sandy and gravelly base. The gravel is all of small size, considerably iron stained, and usually well compacted by interstitial sand and loam. This soil is well drained and easily tilled. It is a fair corn soil and excellent for orchard fruits like peaches, plums, and pears.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	39.14	18.88	34.99	9.20
Subsoil	6	32.15	18.19	23.15	14.75

	Acres.
Kent County sheet, Maryland	8,060
Salem sheet, New Jersey	43,210
Trenton sheet, New Jersey	3,712

Soledad gravelly sand.—Very coarse brown sand and fine gravel, composed of sharp fragments of granitic rocks and 6 feet or more in depth. Occurs upon large fans of from 3° to 5° slope extending from granitic foothill formation. Surface sometimes becomes compact and very hard, especially when packed in roads. Rather deficient in plant food and not retentive of moisture. Adapted to grain, with fair yield in favorable seasons. Free from alkali.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	51.20	23.18	13.16	8.56

	Acres.
Salinas sheet, California	230
Soledad sheet, California	7,370

Yakima gravelly loam.—A loam soil containing from 25 to 80 per cent of rounded, waterworn basaltic gravel, usually from one-half inch to 3 inches in diameter. Occupies valleys along small streams, and has been formed by material brought down from higher levels by these streams. Greater part used for pasture, although when cleared and cultivated, well adapted to the growth of fruits, vegetables, and small berries.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	13.30	33.20	44.34	7.88

	Acres.
Walla Walla sheet, Washington	10,048

DUNESAND.

Dunesand.—Soil consists of incoherent sand to a depth of 3 feet or more, often exceeding 100 feet. Occupies hillocks, rounded hills,

or ridges from 2 to 175 feet in height. Found along shores of lakes or ocean and in deserts. At present generally of no agricultural value on account of the irregular surface and the unstable and drifting nature of the sand, but in arid regions often very productive when leveled and under irrigation.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	25.34	60.39	1.74	2.24
Subsoil	1	13.38	82.92	.78	.75

	Acres.
Allegan County sheet, Michigan	3,130
Holly sheet, Colorado	576
Imperial sheet, California	29,840
Lamar sheet, Colorado	384
Las Animas sheet, Colorado	2,368
Ventura sheet, California	2,020

SANDHILL.

Sandhill.—Coarse, loose, incoherent sand, 10 feet or more in depth. Hills from 20 to 200 feet or more in height, representing old shore lines of the ocean or formed by river action and wind, occurring as long, narrow ranges and frequently as isolated hills. Material is generally so loose and incoherent and so thoroughly drained that it seldom has any agricultural value.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	55.20	35.79	4.61	2.38
Subsoil	1	66.14	26.70	3.36	3.80

	Acres.
Craven sheet, North Carolina	140
Darlington sheet, South Carolina	30,656
Kinston sheet, North Carolina	2,200
Newbern sheet, North Carolina	960
Princeton sheet, North Carolina	2,160

SAND.

Arecibo sand.—A loose, incoherent red to white coral and quartz sand, 12 to 36 inches or more deep. Occupies slightly rolling land. Soil is probably derived from wind-blown beach sand. Naturally poor soil. Similar to the Florida pineapple land. Produces some pasturage and a few cocoanuts.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	23.43	41.96	3.25	1.29
Subsoil	1	34.95	56.80	4.22	3.63

	Acres.
Arecibo sheet, Porto Rico	7,580

Beaufort sand.—Black, sandy soil, from 3 to 12 inches deep, mixed with a large amount of organic matter and underlain by yellow sand of a sticky nature, which is in turn underlain at a depth of from 2 to 3 feet by a yellow sand resembling quicksand. Found on low divides in Atlantic Coastal Plain. Almost entirely uncultivated and covered by a sparse growth of pines, wire grass, and scattering shrubs. Will produce good quality of bright tobacco.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	21.23	62.36	7.88	7.25
Subsoil	1	31.62	48.08	10.00	8.93

	Acres.
Craven sheet, North Carolina	10,600

Cassadaga sand.—Coarse orange or gray sand 1 to 3 feet or more deep. Occurs usually in upland valleys. Inclined to be wet or marshy, and needs drainage because of a hardpan subsoil. Very little under cultivation, is usually wooded, and generally has a thick growth of underbrush. Has at present little agricultural value. If it were cleared and drained, it would probably be suited to grass.

Average mechanical analysis.

Description.	No. of sample.	1	2	3	4
Soil	1	22.58	43.82	21.74	10.45

	Acres.
Westfield sheet, New York	1,660

Clyde sand.—The soil consists of 12 inches of black medium and fine sandy loam, underlain by sand to a depth of 30 inches, in turn generally underlain by clay. Occupies low, flat lands, generally swampy, and borders stream courses. When well drained, produces good crops of corn, wheat, grass, oats, rye, and all kinds of truck crops. Excellent soil for sugar beets.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	29.65	50.51	11.29	4.54
Subsoil	3	49.04	43.83	2.81	2.36

	Acres.
Allegan County sheet, Michigan	38,600

Coral sand.—Drifted, incoherent beach sand, 24 to 36 inches deep, formed from coral and shells by wind and wave action, underlain by a slightly loamy sand. Occupies low-lying lands on coast, occasionally forming slight hills 15 to 20 feet above sea level. Adapted to cocoanut trees.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	61.87	29.91	3.71	4.35
Subsoil	1	45.96	34.80	8.60	10.44

	Acres.
Arecibo sheet, Porto Rico	2,620

Fresno red sand.—This soil consists of compact red sand of medium texture to a depth of 6 feet or more. It is derived from disintegra-

tion of crystalline rocks. This material has been carried down from the mountains and distributed usually in gentle slopes by foothill streams. The surface is also somewhat modified by wind action. It is well drained, free from alkali, and adapted to vines, stone fruits, and truck crops.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	5	42.29	48.41	6.66	4.59

	Acres.
Fresno sheet, California	43,776

Fresno sand.—Coarse, loose, incoherent sand, 6 feet or more in depth, naturally free from alkali. Level plains, deltas; of sedimentary origin. Adapted to stone fruits and truck when irrigated; occasionally dry-farmed to wheat. Is used for English walnuts. Similar to Norfolk sand truck soils of the Eastern States.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	25	31.08	51.48	9.77	4.61
Subsoil	9	26.90	46.81	16.03	6.55

	Acres.
Fresno sheet, California	163,200
Hanford sheet, California	20,790
Holly sheet, Colorado	55,232
Lamar sheet, Colorado	13,056
Las Animas sheet, Colorado	12,800
Rockyford sheet, Colorado	14,592
Salinas sheet, California	11,560
Salt Lake sheet, Utah (mapped as Jordan sand)	3,020
San Gabriel sheet, California	15,190
San Gabriel sheet, California (mapped as San Gabriel gravelly sand)	30,230
Santa Ana sheet, California	66,380
Soledad sheet, California	13,470
Ventura sheet, California	6,430
Weber County sheet, Utah	21,800
Weber County sheet, Utah (mapped as Jordan sand)	1,900

Galveston sand.—Light gray sand, 12 inches in depth, containing usually a large percentage of fine particles of shell. Subsoil is of same character as soil, a little lighter in color, and with larger shell fragments. Occurs as a narrow ridge along shore of Gulf of Mexico, owing its origin to wave action. At present not cultivated, but has been utilized for truck growing with the aid of fertilizers. Similar to pineapple soil of southern Florida.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	6.76	91.80	.06	.46
Subsoil	1	14.62	84.60	.10	.14

	Acres.
Brazoria sheet, Texas	1,152

Hanover sand.—A grayish-brown sand and fine gravel 10 inches deep, underlain by a sticky yellow sand or sand and gravel. Usually only 10 or 15 per cent of fine gravel in surface soil. Surface rolling or sloping and well drained. Derived from wash of Afton fine sandy loam or Janesville sandy loam. Produces crops below the average, except in wet seasons.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	30.15	42.69	18.99	7.78
Subsoil	1	15.28	53.90	18.78	11.80

	Acres.
Janesville sheet, Wisconsin	11,648

Imperial sand.—Fine sand 5 feet deep, underlain by loam or clay. The sand is generally well drained and free from harmful quantities of alkali, but the loam or clay subsoil contains alkali in excess, which will rise to the surface, to the detriment of the land, should excessive irrigation be practiced. This soil is adapted to any of the crops suitable to the climate.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	1.54	78.73	14.17	4.17
Subsoil	1	.70	18.82	43.30	31.30

	Acres.
Imperial sheet, California	1,020
Yuma sheet, Arizona	9,062

Maricopa sand.—A coarse, loose, incoherent sand 3 feet deep, underlain by sandy loam grading to sandy adobe. Occupies higher slopes and levels. Has excellent natural drainage. Owes its origin to deposition by streams. Alfalfa principal crop. Best adapted to tomatoes, melons, and truck.

	Acres.
Holly sheet, Colorado	1,216
Lamar sheet, Colorado	832
Las Animas sheet, Colorado	896
Rockyford sheet, Colorado	11,264

Miami sand.—Coarse to medium, loose, incoherent sand, underlain by yellow or reddish sand of about the same texture. Typical truck soil. Is the prototype of the Norfolk sand of the Atlantic coast and Fresno sand of the Pacific coast. It may be either of glacial or alluvial origin. Level or rolling in topography.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	11	30.28	51.21	15.44	4.06
Subsoil	13	40.95	51.29	4.18	2.98

	Acres.
Allegan County sheet, Michigan (mapped as Allegan sand)	117,480
Posey County sheet, Indiana	7,680
Toledo sheet, Ohio	36,672
Wichita sheet, Kansas	19,392

Norfolk sand.—Coarse to medium sand, friable and not cohering. Is a common type along the low, flat river necks and forelands of the Atlantic Coastal Plain. It is also found along the steep valley

slopes of the streams of the region. It is a typical truck soil. Sweet potatoes, watermelons, cantaloupes, and early tomatoes are raised with profit. The Maryland type of export tobacco is partly produced on this soil. The surface soil usually contains more organic matter than the subsoil, and is therefore slightly more loamy. This type resembles Hartford sandy loam and is the prototype of the Fresno sand and Miami sand.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	31	32.01	51.85	11.35	3.36
Subsoil	20	30.65	46.13	14.45	7.19

	Acres.
Calvert County sheet, Maryland	58,000
Cecil County sheet, Maryland	46,600
Craven sheet, North Carolina	87,930
Darlington sheet, South Carolina	71,104
Harford County sheet, Maryland	2,470
Kent County sheet, Maryland	30,760
Kinston sheet, North Carolina	45,030
Newbern sheet, North Carolina	18,870
Perry County sheet, Alabama	4,160
Prince George County sheet, Maryland	23,630
Princeton sheet, North Carolina	8,280
St. Mary County sheet, Maryland	27,500
Salem sheet, New Jersey	78,410
Trenton sheet, New Jersey	50,880
Willis sheet, Texas	8,560

Norfolk sandy soil.—Coarse, yellow sandy soil, 6 to 12 inches deep; coarse, yellow sandy subsoil, resting on red or yellow clay, 18 to 30 inches deep. Level or gently rolling land of the Coastal Plain region, Atlantic Coast States. Adapted to early truck, bright tobacco, and cotton, according to situation as regards ocean and climatic conditions.

Average mechanical analyses.

Description,	No. of samples.	1	2	3	4
Soil	4	45.99	38.53	9.75	5.36
Subsoil	3	32.95	28.01	11.29	25.42

	Acres.
Clayton sheet, North Carolina	57,810
Darlington sheet, South Carolina	65,024
Kinston sheet, North Carolina	8,640
Princeton sheet, North Carolina	37,460

Oxnard sand.—Brownish sand, consisting chiefly of quartz particles, medium to fine in texture, 6 feet or more in depth. Occurs on river deltas. When first cultivated is shifted by the winds, and in Ventura County, Cal., protection by wind-breaks of trees is necessary. The grains of sand have been somewhat rounded by wind action. This soil is best adapted to lima beans and English walnuts, which are grown both with and without irrigation. On alkaline areas sugar beets are successfully grown. Barley and corn are also grown.

	Acres.
Ventura sheet, California	16,200

Pecos sand.—Fine sand, 6 feet or more in depth, except where drifted over other formations. Lies along rivers by which it has been transported from the mountains. The action of the wind has extended the areas, and the surface is usually covered with dunes. The soil is calcareous and contains small amounts of alkali, though not enough to injure plants. Characteristic vegetation: Mesquite, willow, canaigre, yucca, and cottonwood. Generally well drained. Adapted to truck, fruit, melons, potatoes, and root crops.

	Acres.
Carlsbad sheet, New Mexico	2,810
Salt River Valley sheets, Arizona	13,960

Porters sand.—Grayish-yellow coarse sand, 10 inches in depth, overlying coarse sand and masses of broken rock. Fragments of rock and huge bowlders scattered on the surface. Occupies mountain slopes. Is derived from weathering of granite, gneiss, and similar rocks. Where slopes are not steep, used to some extent for general farming. Formerly bright tobacco was grown. Adapted to peach and grape culture.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	42.32	29.66	12.65	13.97
Subsoil	6	48.72	30.19	10.29	10.29

	Acres.
Buckingham sheet, Virginia	76,864
Harrisonburg sheet, Virginia	12,800
Hickory sheet, North Carolina	128
Mount Mitchell sheet, North Carolina	42,816
Taylorsville sheet, North Carolina	11,136
Waynesboro sheet, Virginia	25,472

Salt Lake sand.—Sand consisting of about 80 per cent medium-sized egg-shaped or spherical particles, largely calcareous. Occupies level or dune areas. Near Great Salt Lake, Utah, soil derived from the breaking up of lime hardpan, the peculiar and regular shape of its particles resulting from the wearing and polishing action of wind and water. As found in the vicinity of Great Salt Lake soil is of no agricultural value because of its limited extent and its position.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	84.22	15.32	0.51	

	Acres.
Salt Lake sheet, Utah	1,140

Saugatuck sand.—Soil to a depth of 9 inches consists of reddish-brown, black, and gray sands. Subsoil to a depth of 3 feet or more consists of medium fine sand, containing bands of sand cemented by ferruginous material. These bands of iron crust vary from a fraction of an inch to 1 or more feet in thickness. Occupies slightly depressed areas. The accumulation of iron is probably due to deficient drainage now or at some former period. Truck, peaches, and small fruits do best, and grain fairly well.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	40.76	47.64	6.98	3.15
Subsoil	3	48.05	43.65	2.90	2.85

	Acres.
Allegan County sheet, Michigan	24,120

Vernon sand.—A loose, incoherent sand of medium texture, about 18 inches deep, underlain by a looser and coarser material. In color it ranges from a yellow in its least typical phase to a reddish-brown where, on the upland, it contains some organic matter. The river-flat phase contains a little silty material. The upland phase is at times slightly sticky, probably from the presence of lime carbonate. The upland areas are always well drained. Kafir corn, sorghum, and cotton principal crops. Apples, peaches, and melons do well. The lowland phase used for pasturage.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	20.33	67.47	7.99	4.02
Subsoil	3	16.31	65.87	11.21	6.39

	Acres.
Vernon sheet, Texas	56,448

Westphalia sand.—Fine sand or slightly loamy sand, loose and friable when dry, but compacting slightly when wet, underlain at a depth of from 9 to 16 inches by a fine-grained, loamy sand, somewhat more adhesive. Derived mainly from Cenozoic formations. Occurs on gently sloping valley walls and low, rolling hills. Forest growth: Oak, sycamore, tulip, and chestnut. Well adapted to tobacco, corn, potatoes, peaches, strawberries, and small fruits; less suitable for grass and grain.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	11.72	63.90	14.83	7.05
Subsoil	4	10.42	59.06	19.91	8.27

	Acres.
Prince George County sheet, Maryland	36,190
Salem sheet, New Jersey	4,470
Trenton sheet, New Jersey	1,408

Willis sand.—Grayish-yellow medium sand, with considerable silt, having an average depth of 10 to 18 inches, but sometimes extending to 36 inches, and underlain by sticky yellow, red, and gray mottled sand. Scattered iron concretions and rounded quartz pebbles are found in both soil and subsoil. The latter retains water like a clay. Residual soil, and probably derived from some Eocene or later formation. Some areas not well drained. Natural growth, pines, sweet gum, oak, chinquapin, and magnolia. Furnishes some forest grazing. In well-drained areas produces good filler tobacco, truck, and fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	17.14	50.12	27.46	2.84
Subsoil	4	13.42	31.39	28.79	22.01

	Acres.
Willis sheet, Texas	95,300

Windsor sand.—Coarse to medium sand containing fine gravel, 8 inches deep, loose and incoherent. Subsoil is practically the same as the soil, with iron crusts typically developed in the Maryland area. Occurs as level plains in the Connecticut Valley and southern Maryland. Generally considered too light and poor for general farming, but is used to some extent for tobacco, peaches, and truck.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	54.37	30.79	8,97	2.83
Subsoil	12	57.06	30.42	8.23	3.76

	Acres.
Calvert County sheet, Maryland	24,500
Hartford sheet, Connecticut and Massachusetts	29,960
Prince George County sheet, Maryland	37,420
St. Mary County sheet, Maryland	3,450
Salem sheet, New Jersey	18,280
Trenton sheet, New Jersey	512

Yakima sand.—Medium and fine sand, a few inches to 6 feet in depth. Underlain by sandy loam of same composition as Yakima sandy loam. Of æolian origin; occurs in dunes and drifted areas. Adapted to hops, fruit, berries, alfalfa, grass, and truck, but difficult to cultivate on account of drifting. Generally well drained and free from alkali in its uncultivated condition.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	7.73	71.73	14.69	4.72
Subsoil	3	1.83	56.31	35.10	3.89

	Acres.
Caldwell sheet, Idaho (mapped as Snake River sand)	17,430
Sunnyside sheet, Washington (mapped as Sunnyside sand)	20,660

FINE SAND.

Calcasieu fine sand.—A fine sand or fine sandy loam, 18 inches in depth, underlain by 10 inches of loam bearing some silt and sand. Loam grading to mottled clays. Subsoils often carry iron concretions. Fine sand phase is a loose, incoherent gray or dark sand derived in the deposition of the coastal terrace. Fine sandy loam phase is a yellow sand or sandy loam occupying districts near rivers. Type found in low ridges and pine regions. Adapted to truck and orchard crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	1.35	56.43	31.90	8.21
Subsoil	4	1.25	38.08	33.51	24.39

	Acres.
Lake Charles sheet, Louisiana	13,970

Elsinboro fine sand.—Fine brown, loamy sand, 8 inches deep, overlying fine yellow loamy sand to a depth of 3 feet or more. Low rolling lands. Well drained on slopes, but in small hollows

wet and poorly drained. Produces fair crops of corn and oats, medium crops of wheat, good of grass. Specially adapted to late truck. Outside of New Jersey this will be known as Norfolk fine sand.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	15.85	43.73	32.07	6.96
Subsoil	3	14.78	40.61	35.05	8.44

	Acres.
Salem sheet, New Jersey	11,240
Trenton sheet, New Jersey	26,176

Fresno fine sand.—Dark reddish fine sand, micaceous, usually 6 feet or more deep, but often streaked with coarse sedimentary deposits. Sometimes underlain by sand or fine sandy loam. Occurs in level delta plains and low river terraces. Derived largely from disintegration of granitic rocks. Generally well drained, but at times (in the Hanford area) alkaline. Excellent fruit soil. Used for alfalfa, beets, potatoes, and truck crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	6.06	67.91	21.34	3.78
Subsoil	3	2.57	52.47	35.15	6.68

	Acres.
Hanford sheet, California (mapped as Hanford fine sand)	51,250
Holly sheet, Colorado	2,368
Lamar sheet, Colorado	1,344
Las Animas sheet, Colorado	960
Rockyford sheet, Colorado	1,280
Salinas sheet, California (mapped as Hanford fine sand)	9,620
Soledad sheet, California (mapped as Hanford fine sand)	7,420

Miami fine sand.—A fine yellow or light-brown sand 6 to 12 inches deep. The subsoil consists of a fine orange or yellow sand. Free from stones; occasionally occurs as dunes. Has good natural drainage, and is easily tilled. The principal crops are corn, potatoes,

berries, and, of less importance, wheat, oats, grasses, and cabbages. Best adapted to truck, potatoes, and small fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	18.49	63.22	13.12	4.52
Subsoil	7	12.81	69.19	11.75	4.64

	Acres.
Dubuque sheet, Iowa	2,624
Lyons sheet, New York	14,656
Tazewell County sheet, Illinois	22,976
Wichita sheet, Kansas	15,744

Yakima fine sand.—A light brown, gray, or ash-colored sand 3 feet deep, underlain by sand or gravel. Occupies low, level terraces or benches along Clearwater River. Easy to cultivate, and owes its origin to weathering of blended alluvial deposits. Fruit the principal product.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	4.65	54.38	32.21	5.65
Subsoil	1	7.70	51.36	32.92	6.72

	Acres.
Lewiston sheet, Idaho	2,112

SANDY LOAM.

Arecibo sandy loam.—Heavy red sandy loam, with an average depth of 10 inches, underlain to a depth of 36 inches by a rather tenacious clay loam. Found in valleys between outlying limestone hills. Elevation between 30 and 100 feet. Naturally well drained. Used for truck and fruit. Small area devoted to tobacco and sugar cane.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	22.90	57.22	6.39	13.83
Subsoil	1	17.22	47.72	8.54	25.24

	Acres.
Arecibo sheet, Porto Rico	2,690

Billings sandy loam.—A loam 0 to 12 inches deep, underlain by light yellow sandy loam 3 to 15 feet deep, under which is found sandstone fragments, gravel, or sand. Tills very easily. Occupies hills. Is derived from disintegrated sandstone. Underdrainage good. Adapted to all crops of the valley.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	1.40	60.98	22.48	11.54
Subsoil	2	1.26	74.94	12.67	10.61

	Acres.
Billings sheet, Montana	13,568

Boise sandy loam.—Light gray, flaky, ashy-textured sandy loam, micaceous, loose, and powdery. From a few inches to 40 or 50 feet in depth. Surface 6 feet often interstratified with loam soil and sand or sandy loam lime hardpan, but in places sandy loam extends to bed rock. Soil rests on coarse gravel and cobbles. Some alkali in local spots in loam subsoil. Usually found on mesas. Lake sediment, probably derived from basalt. Well drained. Adapted to truck, grain, and clover. Where the hardpan is not very thick fruit and alfalfa do well.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.64	18.95	66.59	8.29
Subsoil	7	22.91	20.90	40.11	11.85

	Acres.
Boise sheet, Idaho	39,800
Caldwell sheet, Idaho	56,050

Cecil sandy loam.—Soil is sandy loam of a brownish or yellowish color, 6 to 15 inches deep; subsoil is a clay, containing coarse sand of reddish or yellowish color, both soil and subsoil containing fragments of quartz, with usually considerable quartz on the surface. High rolling land of Piedmont Plateau. Partly sedimentary; derived from granite, gneiss, and other metamorphosed rocks. Corn and cotton soils of North Carolina and South Carolina; both bright and dark shipping tobacco in Virginia. Lightest desirable soil for general farming purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	22	32.03	36.93	20.17	10.60
Subsoil	22	16.12	17.27	19.73	40.99

	Acres.
Abbeville sheet, South Carolina	81,216
Bedford sheet, Virginia	33,740
Buckingham sheet, Virginia	5,952
Cary sheet, North Carolina	26,090
Clayton sheet, North Carolina	15,560
Cobb County sheet, Georgia	23,170
Covington sheet, Georgia	27,500
Due West sheet, South Carolina	155,072
Harrisonburg sheet, Virginia	2,944
Hickory sheet, North Carolina	206,848
Prince Edward sheet, Virginia	91,710
Statesville sheet, North Carolina	148,910
Taylorsville sheet, North Carolina	149,120
Waynesboro sheet, Virginia	38,912

Collington sandy loam.—Loose, loamy, brown sand, usually containing considerable coarse sand, 9 to 20 inches deep, derived from weathering of green glauconite sand, underlain by sticky yellow or greenish-yellow claylike material with glauconite particles. At 30 to 40 inches greensand, in original purity, occurs. Very productive area, "Forest of Prince George," Maryland. Used for general farming; excellent for small fruits, nurseries, and truck. Good tobacco soil. Contains large amount of potash (2.5 per cent). Same soil is derived from Cretaceous greensand in New Jersey, where it is used for general farming and truck production.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	11	23.35	50.21	13.62	10.33
Subsoil	8	23.25	41.90	11.38	21.70

	Acres.
Prince George County sheet, Maryland	23,260
Salem sheet, New Jersey	4,170
Trenton sheet, New Jersey	83,456

Dauphin sandy loam.—Sandy shale loam, 6 to 15 inches deep, underlain by the same material slightly heavier. It is derived from a formation consisting of alternate beds, each 6 or more inches in thickness, of sandstone and shale. It is easily tilled, and is adapted to a wide range of crops, as well as possessing qualities suited for certain kinds of trucking and the growing of wrapper-leaf tobacco.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	18.32	28.73	30.23	18.64
Subsoil	2	32.58	24.48	25.22	18.91

	Acres.
Lebanon sheet, Pennsylvania	11,220

Deer Flat sandy loam.—Fine red micaceous sandy loam, a few inches to 3 feet in depth. Subsoil sandy loam and sand to perhaps 50 or 100 feet. Occurs in higher lying valley areas, and has a generally level surface. Free from alkali in areas mapped. Only small portion cultivated, owing to lack of water for irrigation. Good for truck, grain, clover, and fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	6.21	56.22	26.30	8.33
Subsoil	3	6.55	57.94	23.34	7.88

	Acres.
Caldwell sheet, Idaho	45,380

Dunkirk sandy loam.—Sandy loam 6 to 10 inches deep, underlain by medium or fine sand. Occurs in lake forelands and is usually marked by hummocky or undulating topography. In part æolian in origin. Adapted to grapes; is also fair grass land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	9.96	36.44	30.68	15.28
Subsoil	1	5.22	43.64	35.94	13.26

	Acres.
Westfield sheet, New York	22,090

Durham sandy loam.—Sandy loam 12 inches deep, overlying yellow clay of Piedmont area. Residual soil derived from granites, gneisses, and mica-schist. Ten to 30 per cent of quartz and rock fragments in both soil and subsoil. Excellent cotton soil; good for corn and also used for tobacco and truck to some extent.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	14	34.66	41.12	16.32	6.51
Subsoil	14	22.22	26.61	16.25	30.74

	Acres.
Abbeville sheet, South Carolina	6,400
Alamance County sheet, North Carolina	84,900
Cary sheet, North Carolina	8,090
Clayton sheet, North Carolina	20,950
Due West sheet, South Carolina	21,440
Hickory sheet, North Carolina	6,016
Prince Edward sheet, Virginia	20,710
Statesville sheet, North Carolina	10,560
Taylorsville sheet, North Carolina	1,344

Elsinore sandy loam.—Light-colored sandy loam, 4 feet in depth, underlain by coarse sand, grading into gravel. Low, level portions of Sevier Valley, Utah. Derived from river transported material; poorly drained and contains considerable alkali near the surface. At present only adapted to salt-grass meadows.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	8.30	38.87	35.83	10.07
Subsoil	12	18.27	47.32	23.87	6.41

	Acres.
Boise sheet, Idaho (mapped as Caldwell sandy loam)	11,780
Caldwell sheet, Idaho (mapped as Caldwell sandy loam)	21,320
Sevier Valley sheet, Utah	7,800

Enfield sandy loam.—Sand 2 feet in depth, underlain by Triassic stony loam material; extending as a terrace around the glacial hills of the Connecticut Valley in Connecticut and Massachusetts. Lacustrine deposit over glacial material. Recognized as good soil for the wrapper tobacco of that locality; rather light for general agricultural purposes. Probably Penn sandy loam.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	32.00	51.69	8.63	3.69
Subsoil	1	17.02	54.03	18.39	5.57

	Acres.
Hartford sheet, Connecticut and Massachusetts	33,150

Fancher sandy loam.—Dark-red micaceous sandy loam, 6 feet or more in depth, derived from stream wash from foothills, well drained and free from alkali, containing relatively high percentage of organic matter. Occupies foothill-stream bottoms and sinks. Generally adapted to fruit and vineyards.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	18.60	45.63	22.84	10.66
Subsoil	3	27.07	45.09	19.57	6.12

	Acres.
Fresno sheet, California	12,832
Hanford sheet, California	19,860

Fresno sandy loam.—Sandy loam or very fine sand with properties of sandy loam, 3 feet in depth, white in color, ashy texture, and locally known as "white-ash land," underlain by bluish calcareous alkali hardpan, which softens upon application of water. Lower level plains of Fresno County, Cal., derived from degradation of beds of sand, clay, and volcanic ash. Generally contains alkali; when free from such it is an excellent grape and fruit soil.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	8.79	53.18	25.59	7.83
Subsoil	7	7.94	53.62	29.49	7.05

	Acres.
Fresno sheet, California	69,811
Hanford sheet, California	10,860

Goldsboro compact sandy loam.—Sharp sandy loam, 3 feet or more in depth, forming a firm, compact surface in roads, and requiring frequent cultivation of young and tender vegetation to prevent injury from the compact crust which is liable to form. Level plains in Atlantic Coastal Plain. Adapted to cotton and corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	32.43	35.56	18.91	10.99
Subsoil	3	22.64	28.84	19.15	28.49

	Acres.
Craven sheet, North Carolina	25,910
Darlington sheet, South Carolina	118,208
Kinston sheet, North Carolina	26,560
Newbern sheet, North Carolina	4,090
Princeton sheet, North Carolina	11,300

Hagerstown sandy loam.—A fine sandy loam, about 12 inches deep, of a gray to yellowish or light-brown color. Subsoil a yellowish-red clay. Occupies some of the higher ridges of the valley. Good drainage. Of residual and colluvial origin from limestone débris. Wheat, corn, and grass are grown. Adapted to fruit, particularly peaches.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	21.32	30.46	35.23	12.35
Subsoil	4	8.55	15.97	26.86	47.58

	Acres.
Bedford sheet, Virginia (mapped as Murrill sandy loam)	11,910
Harrisonburg sheet, Virginia	55,520
Waynesboro sheet, Virginia	9,984

Hartford sandy loam.—Sandy loam, 12 inches deep, underlain by sand to a depth of 3 feet or more. Lacustrine deposits. Level or gently rolling terraces of the Connecticut Valley. Recognized as one of the best soils for the present type of wrapper tobacco of that locality; adapted to truck, but too light and sandy for general farm crops. Outside the Connecticut Valley similar soils will be classed with Norfolk sand.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Subsoil	5	35.28	54.02	4.99	3.22

	Acres.
Hartford sheet, Connecticut and Massachusetts	54,920

Imperial sandy loam.—A fine-grained sandy loam, 3 feet deep, underlain by clay or loam; formed by deposition of coarsest sediments carried by Colorado River. Surface irregular and covered with dunes. Where free from excess of alkali the soil is adapted to any crop suitable to southern arid regions.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	0.57	24.88	56.30	13.01
Subsoil	5	4.18	20.05	41.18	32.19

	Acres.
Imperial sheet, California	23,710
Yuma sheet, Arizona	12,806

Jordan sandy loam.—Sandy loam, 2 feet deep; loam to 4 feet; sand to 5 feet, underlain by clay. Level plains, generally well drained. Derived from lacustrine deposits and river sediments. When well drained and free from alkali it is recognized as one of the best of soils for general agricultural purposes and such crops as grain, alfalfa, and fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	7.26	40.96	31.61	12.18
Subsoil	4	1.61	42.35	34.20	15.82

	Acres.
Salt Lake sheet, Utah	48,620

Laurel sandy loam.—An alluvial sandy loam, 2 to 6 feet deep, light yellow to black in color, underlain by gravel and sand at lower depths. Surface usually level, cut by sloughs and old river channels, and swampy areas due to seepage from irrigating ditches. Derived from deposits of the Yellowstone River. Except in parts affected by alkali, is excellent for growing grain, vegetables, and fruits.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	4.13	53.56	35.57	11.43
Subsoil	2	4.03	59.59	25.69	10.72

	Acres.
Billings sheet, Montana	8,832

Maricopa sandy loam.—Sandy loam with less than 10 per cent of gravel, 3 feet in depth, underlain by sandy loam containing layers of calcareous hardpan. Medium elevation in Salt River Valley, Arizona. Adapted to alfalfa, fruit, and grain.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	12	17.94	46.85	18.81	12.67
Subsoil	3	7.27	38.43	28.94	25.02

	Acres.
Holly sheet, Colorado	37,696
Lamar sheet, Colorado	15,872
Las Animas sheet, Colorado	39,104
Rockyford sheet, Colorado	63,424
Salt River Valley sheets, Arizona	106,906

Miami sandy loam.—A light to dark-brown sandy loam, 8 to 14 inches deep, underlain by a sandy loam somewhat heavier, sometimes containing some fine gravel, and underlain by gravel, but not necessarily so; either of alluvial or glacial origin; level or gently rolling; sometimes rounded hills with kettlelike intervening depressions, as well as extensive lowlands bordering water courses. In some areas adapted to corn, wheat, grass, rye, and oats, in others mainly to fruits, small fruits, and truck crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	11	21.75	48.48	20.60	8.44
Subsoil	11	19.98	49.69	19.79	10.61

	Acres.
Allegan County sheet, Michigan (mapped as Allegan sandy loam)	60,020
Dubuque sheet, Iowa	15,040
Grand Forks sheet, North Dakota	68,800
Montgomery County sheet, Ohio	4,000
Posey County sheet, Indiana	3,584
Toledo sheet, Ohio	30,528

Orangeburg sandy loam.—A gray sandy loam, from 8 to 24 inches deep, resting upon a red or reddish-yellow sandy clay; contains some gravel and iron concretions; occupies rolling country, and is probably derived from the sandy mantle and the clays of the Lafayette formation. Cotton principal product. Corn yields from 10 to 20 bushels to the acre.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	14.74	60.25	14.64	8.07
Subsoil	5	10.61	44.28	18.03	22.88

	Acres.
Darlington sheet, South Carolina	9,984
Perry County sheet, Alabama	196,288

Oxnard sandy loam.—Brown or black, mellow, loose, friable, open soil of peculiar woody feel; 4 to 5 feet deep, underlain by heavy sandy loam or loam; derived from waste from sandstone and shale hills; occurs on delta plains; when free from alkali, adapted to lima beans and sugar beets; when alkaline, adapted to sugar beets and barley. Generally well drained, but frequently containing a harmful quantity of alkali salts.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	26.66	37.88	18.36	12.60
Subsoil	1	5.50	29.72	27.84	30.92

	Acres.
Ventura sheet, California	53,200

Pecos sandy loam.—Soil is a fine-grained gray sandy loam, 30 inches deep; subsoil is a gray, light loam, slightly heavier than the soil. High, level, valley land, derived from lacustrine deposits; well drained and generally free from alkali. Recognized as the best general farming land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	2.23	46.53	25.86	17.44
Subsoil	1	.37	36.03	27.37	31.05

	Acres.
Carlsbad sheet, New Mexico	24,770
Roswell sheet, New Mexico	11,540

Penn sandy loam.—Soil, sandy loam, 6 to 15 inches; underlain by heavier loam or clay loam, usually Indian red in color; sandstone fragments to the extent of 5 to 20 per cent generally present. It is derived from the Triassic brown sandstone. The surface varies from rolling to moderately hilly land. It is easily tilled. Crops are of good quality, but light yield.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	21.92	35.67	27.09	13.25
Subsoil	2	20.21	24.11	32.62	20.07

	Acres.
Buckingham sheet, Virginia	5,568
Lebanon sheet, Pennsylvania	40,590
Trenton sheet, New Jersey	10,816

Placentia sandy loam.—Sandy loam, 3 feet in depth, underlain by sandy adobe. Surface material is compact and grades into the sandy adobe. High mesa land, valley lands, and high plains and rolling hills; remnant of old flood plain subsequently modified by wind action. Well drained and free from alkali. At present adapted to citrus and other fruit when water supply is available; dry farmed, to wheat, barley, and black-eyed beans.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	17.77	36.90	29.99	12.75
Subsoil	3	17.16	37.45	28.50	14.23

	Acres.
Salinas sheet, California	59,090
San Gabriel sheet, California	48,820
Santa Ana sheet, California	16,857
Soledad sheet, California	14,910
Ventura sheet, California	23,880

Ponce sandy loam.—Brown sandy loam 14 to 36 inches or more in depth. An alluvial soil occupying river deltas in the vicinity of

Ponce. The subsoil is a sandy loam heavier and darker than soil. Sugar cane is the principal crop. Cocoanuts and Guinea-grass also grown. There is a stony phase containing rounded stone fragments, sometimes as large as 2 or 3 feet in diameter. This phase is used only for pasture, and at present has little value.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	10.27	42.89	34.60	12.03
Subsoil	2	1.28	22.13	67.12	19.31

	Acres.
Arecibo sheet, Porto Rico	6,550

Porters sandy loam.—A grayish yellow sandy loam 6 to 15 inches deep. The subsoil is a tenacious red clay. Both soil and subsoil contain fragments of quartz and other rocks. Occupies mountain or high rolling lands. A residual soil. Wheat, corn, oats, rye, potatoes, and fruit are the principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	13	27.08	31.21	27.21	13.49
Subsoil	13	21.52	25.30	27.12	25.36

	Acres.
Bedford sheet, Virginia	46,150
Mount Mitchell sheet, North Carolina	76,480
Taylorsville sheet, North Carolina	49,792

Quinton sandy loam.—Brown loamy sand, with a trace of gravel, 8 inches deep, overlying clay mixed with medium sand to a depth of 3 feet or more. Occurs along slopes where the Norfolk sand has been worked over with Alloway clay. Derived from recent geological formations. Good general farming land; some trucking. Fine corn soil.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	32.95	33.81	24.20	7.62
Subsoil	4	32.27	30.34	21.73	16.17

	Acres.
Salem sheet, New Jersey	16,790
Trenton sheet, New Jersey	8,640

Redfield sandy loam.—Red sandy loam 6 feet in depth. Soil derived from disintegration of red sandstone, and is usually well drained. In certain areas soil contains gravel within 3 feet of surface, and this gravel increases in amount and size in lower depths. Valley floor, sloping gently toward the mountains, or as upper bench lands. Adapted to alfalfa and grain when so situated that irrigation is possible.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	7.03	42.81	31.42	12.25
Subsoil	12	6.28	43.28	32.26	10.77

	Acres.
Sevier Valley sheet, Utah	44,200

Roswell sandy loam.—Heavy gray sandy loam 12 inches deep; subsoil is a light loam underlain by clay at a depth of 5 feet. Level second-bottom land derived from lacustrine deposits, poorly drained, often containing alkali. Recognized as best farming land.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	3	1.65	47.70	24.03	15.92

	Acres.
Roswell sheet, New Mexico	9,090

Salt Lake sandy loam.—Sandy loam 2 feet deep, underlain by fine sand. Level plains, recent lake bottoms. Soil is poorly drained, contains an excess of alkali, and is bare of vegetation. For these reasons it has no present agricultural value.

	Acres.
Weber County sheet, Utah	49,900

San Joaquin sandy loam.—Reddish light sandy loam 3 feet in depth, frequently hard and compact, underlain by red sandstone hardpan. Along foothill streams hardpan is absent, the sandy loam extending to a depth of 6 feet or more. Generally occupies sloping valley plains. Soil is derived from disintegration of red sandstone rock, well drained, free from alkali, and frequently covered with hog-wallow mounds. Adapted to grain crops, and where hardpan is more than 3 feet from the surface to fruits and vineyards.

Average mechanial analysis.

Description.	No. of samples.	1	2	3	4
Soil	9	27.00	43.30	17.87	8.77

	Acres.
Fresno sheet, California	74,547

Santiago sandy loam.—Sandy loam 3 feet deep, underlain by sand to 5½ feet, which is in turn underlain by sand and gravel. Over a considerable area the gravel comes to the surface and increases in size and amount in the lower depths. Lower delta plains of the foothill streams in Orange County, Cal. Dry-farmed to wheat and barley, and under irrigation at present adapted to fruits of that locality.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Subsoil	1	11.89	52.87	26.72	6.64

	Acres.
Santa Ana sheet, California	17,100

Sassafras sandy loam.—Occurs as low, nearly level terraces along tide-water estuaries in Atlantic coast region. Rarely rises more than

35 feet above sea level. The soil is a brown sandy loam, containing some fine gravel. It rests upon a yellow loam, somewhat sandy, which in turn is frequently underlain by medium yellow sand or gravel. It is an easily tilled, well-drained soil, producing fair general farm crops. It is especially adapted to sugar-corn, peas, tomatoes, etc., for canning purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	19.18	30.38	32.23	10.60
Subsoil	9	18.82	32.28	31.38	18.26

	Acres.
Calvert County sheet, Maryland	10,900
Perry County sheet, Alabama	14,720
Prince George County sheet, Maryland	17,500
St. Mary County sheet, Maryland	4,830

Sedgwick sandy loam.—A medium to fine reddish-brown or chocolate-brown sand 10 inches deep, underlain to depth of 20 inches by a reddish-brown sticky sand, resting on a heavy sandy clay. Occupies rolling upland prairie west of Arkansas River. Adapted to corn, wheat, and other grains. Also a good soil for fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	27.76	50.62	13.98	6.98
Subsoil	1	20.82	41.00	17.18	21.04

	Acres.
Wichita sheet, Kansas	3,136

Utuado sandy loam.—Coarse, yellow sandy loam 7 inches deep, representing soil of deforested area on steep slopes of the lower mountains around Utuado. Residual soil derived from igneous rocks. Subsoil is a shallow yellow sandy loam grading into decomposed granite and other igneous rocks. Little natural fertility and but little used, as a great part of the areas are too steep for cultivation. Should be reforested. Produces a few bananas, some plantains, and coffee.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	48.91	23.90	19.18	8.47
Subsoil	1	48.69	26.85	16.72	8.24

	Acres.
Arecibo sheet, Porto Rico	25,100

Vernon sandy loam.—A dark red to reddish-brown sandy loam from 12 to 18 inches deep, mellow, friable, and easily worked. The subsoil to a depth of 36 inches is heavier in texture, and varies from a red to a brown color. Soil is alluvial in origin and generally well drained. Corn, wheat, kafir corn, oats, and cotton principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	15.63	55.86	16.84	11.20
Subsoil	2	13.84	48.11	22.35	15.13

	Acres.
Vernon sheet, Texas	30,592

Vivi sandy loam.—Yellowish-brown sandy loam, 10 inches deep, forming tracts of alluvial deposits along the larger streams in the mountains near Adjuntas. Subsoil is a yellow-brown sandy loam. Soil is mellow and rich and easy to cultivate. Considered the best tobacco soil in the area. Also adapted to sweet potatoes, beans, and other minor crops. Used to a small extent in the production of sugar.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	26.56	49.34	14.94	8.81
Subsoil	2	13.17	43.85	24.64	18.31

	Acres.
Arecibo sheet, Porto Rico	1,060

Volusia sandy loam.—The soil is a brown or yellow sandy loam 6 to 10 inches deep, resting upon a fine orange sand 3 feet or more in depth; sometimes contains fragments of shale. It is a very productive soil for corn, oats, and potatoes—particularly for the latter, of which large yields are reported. Wheat, however, does not do well and seldom yields even a fair crop. Used for dairying. Small apple orchards numerous.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	11.88	18.11	46.94	16.26
Subsoil	2	14.67	22.22	38.01	19.87

	Acres.
Westfield sheet, New York	69,940

Worsham sandy loam.—Gray sandy loam, generally fine, and of soft, whitish appearance, having a depth of 12 to 14 inches. Subsoil yellowish, sticky, sandy loam or loam to a stiff, plastic, yellow clay, mottled with white. Residual origin from granites, gneisses, and schists. Originally post-oak land. Clover, grasses, hay, and pasturage.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	19.97	42.32	28.35	6.78
Subsoil	2	13.59	26.22	23.83	31.29

	Acres.
Prince Edward sheet, Virginia	8,520

Yakima sandy loam.—Grayish, fine sandy loam, 6 feet or more in depth, with occasional strata of fine sand and bands of volcanic ash in surface 6 feet. Occupies hills, slopes, and level valley floors. Adapted to hops, fruit, and hay crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	15	6.52	29.52	52.28	9.14
Subsoil	15	4.49	23.17	58.08	11.02

	Acres.
Lewiston sheet, Idaho	6,208
Sunnyside sheet, Washington	115,130
Walla Walla sheet, Washington	64,896
Yakima sheet, Washington	34,450

Yazoo sandy loam.—Fine to very fine yellow sand, 0 to 6 inches; brown loamy sand, 6 to 12 inches; fine yellow sand, 12 to 40 inches; or, near the margins of areas, underlain by waxy clay below 12 inches. Occupies low, flat ridges forming front lands near stream courses in river deltas. Chief product is cotton, but soil is suited to truck and market-garden crops. Corn and truck in northern areas.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	21	2.74	39.92	53.92	8.77
Subsoil	19	2.03	26.94	56.16	14.42

	Acres.
Alvin sheet, Texas	4,544
Bentonia sheet, Mississippi	384
Brazoria sheet, Texas	27,328
Clay County sheet, Illinois	1,344
Clinton County sheet, Illinois	2,176
Posey County sheet, Indiana	2,752
St. Clair County sheet, Illinois	12,800
Smedes sheet, Mississippi	8,128
Tazewell County sheet, Illinois	128
Yazoo sheet, Mississippi	15,170
Mayersville sheet, Mississippi	11,500

FINE SANDY LOAM.

Afton fine sandy loam.—A brown loamy sand of medium texture, 18 inches deep, underlain by a medium to fine yellow sand, 2 to 5 feet deep. Occupies gently sloping or nearly level areas; usually well drained and easy to cultivate. Sedimentary in origin. Produces medium crops of grain and tobacco, and is excellently adapted to truck gardening.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	28.59	43.48	18.72	8.73
Subsoil	3	28.11	49.30	12.94	8.67

	Acres.
Janesville sheet, Wisconsin	16,256

Ayden fine sandy loam.—Pale-yellow fine sandy loam, 18 to 36 inches deep, underlain by heavy reddish-yellow fine sandy loam, or loam which becomes heavier with depth. Surface slightly undulating. Sedimentary origin. Found in Coastal Plain at elevation of 50 to 75 feet. Good type of bright tobacco and cotton land, and yields fair crops of corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	13.28	57.60	18.72	7.94
Subsoil	5	13.32	48.97	17.47	18.63

	Acres.
Darlington sheet, South Carolina	25,600
Craven sheet, North Carolina	33,000

Calcasieu fine sandy loam.—This type consists of a compact, gray fine sandy loam from 6 to 18 inches in depth, resting on a clay loam subsoil that grades into a black or yellow clay containing lime nodules and iron concretions. Occurs along streams in very gently rolling areas. A good truck soil and also adapted to pears and berries.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	0.98	48.79	39.02	9.99
Subsoil	7	.96	36.44	39.72	21.55

	Acres.
Alvin sheet, Texas	18,368
Brazoria sheet, Texas	4,672
Lake Charles sheet, Louisiana	5,500

Elmira fine sandy loam.—A light-brown fine sandy loam varying in depth, underlain by a more sandy subsoil or silt, lighter in color. Occupies bottom lands and is of alluvial origin. Well drained, easily tilled, and adapted to all crops of the area, including tobacco.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	1.22	40.73	45.45	11.97
Subsoil	3	1.21	28.49	50.99	15.64

	Acres.
Bigflats sheet, New York	5,632

Fresno fine sandy loam.—Fine sand having the properties of a sandy loam to a depth of from 3 to 6 feet, grading into a coarse sand. Coastal and delta plains of rivers. Well adapted to such crops as alfalfa, lima beans, and grain, and truck crops, but not so well adapted to fruit, except when well drained. A fine English-walnut soil in southern California.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	16	6.05	46.78	34.89	8.33
Subsoil	10	7.37	52.98	27.42	9.53

	Acres.
Holly sheet, Colorado	71,552
Lamar sheet, Colorado	94,720
Las Animas sheet, Colorado	13,632
Rockyford sheet, Colorado	56,384
Salinas sheet, California	11,850
San Gabriel sheet, California	10,790
Santa Ana sheet, California	11,552
Soledad sheet, California	6,480
Ventura sheet, California	12,900
Weber County sheet, Utah	86,400

Gila fine sandy loam.—Fine sandy loam or very fine sand 6 feet or more in depth, derived from river deposits subsequently modified by wind action. Occupies low bluffs and plains. Adapted to alfalfa and grain crops.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	6	0.66	48.03	39.42	8.17

	Acres.
Salt River Valley sheets, Arizona	18,578
Yuma sheet, Arizona	17,038

Hanford fine sandy loam.—Dark-colored fine sandy loam, micaceous, 4 feet in depth, underlain usually by 2 feet or more of loam or sandy clay. Occurs in level delta plains, and is derived largely from the disintegration of granitic rocks. Good corn and grain land; also valued for vineyards. Generally free from alkali. Probably should have been correlated with Fresno fine sandy loam.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	9.31	36.45	33.93	14.75
Subsoil	2	7.44	36.56	41.28	11.81

	Acres.
Hanford sheet, California	30,010

Lake Charles fine sandy loam.—A dark-brown or black sandy loam, merging sometimes to light gray, 14 inches in depth; subsoil a

loam which grades at 10 inches into a clay loam carrying some silt. Under the clay loam occurs a mottled clay subsoil, often carrying iron or lime concretions. Found on the higher elevations and marked by sand hummocks. Owes its texture to local erosion and admixture of sand from hummock areas. Originally a coastal deposit. Adapted to farm crops requiring light soils and medium drainage.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	1.29	34.48	52.66	9.93
Subsoil	9	1.41	33.83	42.14	19.35

	Acres.
Alvin sheet, Texas	27,392
Brazoria sheet, Texas	11,392
Lake Charles sheet, Louisiana	53,390

Miami fine sandy loam.—Soil to the depth of 10 inches consists of chocolate-brown sandy and silty loam, underlain by a light-brown fine sand. A few stones are present on the surface and mixed with the soil. Rolling country and flat lands bordering swamps. Peaches, cherries, plums, apples, pears, and small fruits are successfully grown, as well as corn, wheat, grass, and pasture. Well adapted to truck growing.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	10	3.25	47.59	41.08	7.21
Subsoil	10	2.85	52.95	34.38	9.24

	Acres.
Allegan County sheet, Michigan (mapped as Allegan fine sandy loam)	13,260
Lyons sheet, New York	29,824
Posey County sheet, Indiana	3,456
St. Clair County sheet, Illinois	138,560
Union County sheet, Kentucky	3,072

Norfolk fine sandy loam.—Fine sandy loam, 12 or more inches deep, underlain by light, friable clay. Level plains in Coastal Plain

region, some areas along rivers subject to overflow. Good soil for late and heavy truck, cotton, and corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	7.99	51.71	27.95	10.10
Subsoil	9	5.63	34.73	22.15	33.81

	Acres.
Craven sheet, North Carolina	148,640
Kinston sheet, North Carolina	36,100
Newbern sheet, North Carolina	55,560
Willis sheet, Texas	11,880

Podunk fine sandy loam.—Fine sandy loam, 12 inches deep, underlain by fine sand. Level terrace of the Connecticut Valley. Lacustrine deposit. Rather light for general farm purposes, but well adapted to present type of broad leaf wrapper tobacco.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Subsoil	2	5.79	78.00	9.96	3.05

	Acres.
Hartford sheet, Connecticut and Massachusetts	3,460

Sturgis fine sandy loam.—A sandy loam, 12 inches in depth, brown or reddish in color, composed of fine sand and silt. Subsoil is a sticky, yellowish, fine sandy loam, grading into a heavy tenacious silt. Level or gently undulating. Origin sedimentary. The crops at present grown are corn, wheat, and grass.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	0.30	66.84	24.96	7.40
Subsoil	1	.34	58.24	24.28	16.96

	Acres.
Union County sheet, Kentucky	2,176

Vernon fine sandy loam.—A fine brownish-red sand about 22 inches deep, carrying considerable silt. The subsoil is the same as the soil, except that it is a little lighter in color in the lower depths. From 4 to 6 feet the material is generally a yellowish-red fine sand. Occupies bluffs along rivers. Surface is slightly rolling and the drainage excellent. Derived from wind-blown river sand when streams were at higher levels. Used principally for pasturage, but adapted to wheat, corn, oats, cotton, and other farm crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	0.85	37.77	54.29	6.80
Subsoil	2	1.03	36.85	53.09	8.73

	Acres.
Vernon sheet, Texas	5,248

Yakima fine sandy loam.—The surface soil is a mellow, friable, brown sandy loam from 10 to 16 inches deep. The subsoil consists of a light brown silty loam, heavier and more plastic than the surface soil. The type is easily tilled and well drained. Generally occupies rolling hills. Wheat is the principal crop.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	11	1.47	15.71	71.99	10.36
Subsoil	7	.96	12.46	76.10	10.04

	Acres.
Lewiston sheet, Idaho	172,992
Walla Walla sheet, Washington	26,688

LOAM.

Arecibo loam.—A dark waxy loam, 6 to 12 inches deep, resting on a yellow sticky loam containing fragments of limestone. The soil is shallow as a rule, but fairly productive. Principally used for pasture near the coast. Inland areas devoted to bananas, plantains,

and to some extent to coffee. A few orange trees were noticed, and appeared to be thrifty. Hardly 10 per cent of the area is in crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	24.31	30.53	25.55	18.70
Subsoil	2	21.73	25.92	25.52	25.98

	Acres.
Arecibo sheet, Porto Rico	17,700

Arkansas loam.—This type consists of a very dark brown loam, fine grained and mellow, about 10 inches in depth. In poorly drained spots it is inclined to be somewhat heavy and sticky, while in areas where it lies in close proximity to the dunes of the Arkansas River it is often modified by wind-blown sand and partakes somewhat of the nature of a sandy loam. The subsoil is composed of a grayish-brown mixture of clay and silt, resting on interstratified layers of sand, medium fine in texture, and clay. The latter is somewhat calcareous, or contains small concretions of lime. The soil is alluvial in origin, and the surface is flat. It is elevated from 6 to 15 feet above the streams, and a part of it is subject to almost annual inundation. Nearly all the ordinary farm crops are grown. The soil is particularly well adapted to alfalfa. Potatoes and other vegetables do well. Grapes and other fruits are grown with profit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	3.55	29.09	54.01	13.01
Subsoil	2	2.75	20.73	50.04	26.00

	Acres.
Wichita sheet, Kansas	45,568

Billings loam.—A gray to black sandy loam, 0 to 12 inches deep, underlain by loam or light clay loam to a depth of from 2 to 6 feet, beneath which is usually found a sandy loam or sand, and occasion-

ally gravel. The surface is generally level. The type is derived from Fort Benton shale and limestone. Adapted to grain and vegetables, and in some localities to fruit.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	1.08	26.60	40.42	30.98
Subsoil	2	1.24	31.97	39.05	27.29

	Acres.
Billings sheet, Montana	14,144

Boise loam.—Red or yellow loam from 6 inches to several feet in depth, underlain with alternating strata of sandy loam and sand, the latter often being cemented by calcium carbonate into a hardpan. Soil particles in the upper stratum of virgin soil also usually cemented together, but not into a compact mass. Surface is usually covered with a coating of sandy loam, varying in depth and having the texture of the Boise sandy loam. Occurs on mesa plains, and is derived from lake sediments. Often alkaline. When subsoil is broken up, is good for fruit, grain, and alfalfa.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	4.60	30.58	43.50	17.43
Subsoil	3	10.87	31.83	33.71	18.41

	Acres.
Boise sheet, Idaho	47,560
Caldwell sheet, Idaho	14,400

Calcasieu loam.—Dark-brown, brownish-gray, or gray silty loam, 6 to 16 inches in depth, grading into clay loam 8 inches deep, beneath which are mottled clays. Origin of soil, coastal deposit. Found in poorly drained areas of depression containing scattered sand mounds. Is an excellent rice soil.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	0.32	21.86	60.04	15.11
Subsoil	3	1.07	21.88	53.96	19.50

	Acres.
Lake Charles sheet, Louisiana	51,280

Cecil loam.—Soil is a loam, or heavy sandy loam, of brown or yellowish color, 10 inches deep; heavy loam or clay loam subsoil of reddish color, both soil and subsoil containing fragments of quartz, with usually considerable quartz on the surface. High rolling land. Derived from granite, gneiss, and other metamorphosed rocks. Occurs in Piedmont Plateau. Recognized as good soil for general farming purposes, but requires careful treatment. Adapted to wheat, corn, and grass. Used extensively for tomatoes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	10	12.22	20.24	43.59	21.38
Subsoil	7	11.86	17.29	42.54	27.72

	Acres.
Buckingham sheet, Virginia	55,488
Cecil County sheet, Maryland	52,600
Harford County sheet, Maryland	110,320
Trenton sheet, New Jersey	13,952
Waynesboro sheet, Virginia	39,104

Cecil mica loam.—Loose brown loam, 12 inches deep, underlain by clay loam, both soil and subsoil consisting largely of small fragments of muscovite mica, which makes it soft and almost incoherent. Rolling land of Piedmont Plateau. Derived from decomposition of highly crystalline rocks; typically developed in Cecil County, Md., and Lancaster County, Pa. Recognized as good land for general farming purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	18.00	30.31	31.35	15.48
Subsoil	5	28.72	31.30	19.50	16.31

	Acres.
Cecil County sheet, Maryland	10,000
Harford County sheet, Maryland	39,930
Lancaster County sheet, Pennsylvania	10,000
Prince George County sheet, Maryland	600

Clarksville loam.—Rich, dark-brown, silty loam, 12 inches deep, underlain by brown loam, heavier in texture, to a depth of 3 to 6 or more feet. Occurs as well-marked bottom lands along rivers and their larger tributaries. Generally well drained, but subject to occasional overflow. Alluvial deposit laid down by rivers along which it occurs. Fine land for corn and hay, but at present little used for other crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	1.39	16.07	64.31	16.50
Subsoil	4	1.62	8.23	62.89	25.67

	Acres.
Clarksville sheet, Tennessee	17,090
Howell County sheet, Missouri	48,512

Conestoga loam.—Brown loam, 12 inches deep, underlain by light clay loam to depth of 30 inches, grading into decomposed schist. Rolling valley land. Derived from decomposition of limestone schist; has a greasy or soapy feel when rubbed between the fingers. Recognized as one of the best of soils for general agricultural purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	5.38	29.27	49.61	10.05
Subsoil	2	5.37	33.95	44.47	12.70

	Acres.
Lancaster County sheet, Pennsylvania	51,000

Conowingo barrens.—Loam 3 feet or more in depth, frequently filled with fragments of broken rock increasing in size and amount

in lower depths; often there is no soil covering over the broken fragments of rock. Rolling upland of Piedmont Plateau. Derived from decomposition of serpentine and rocks of similar nature. Generally unproductive and frequently worthless for agricultural purposes, due to slight depth of soil covering and usually ascribed to preponderance of magnesia.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	7.93	15.49	50.12	22.47
Subsoil	2	5.34	13.63	53.79	22.58

	Acres.
Buckingham sheet, Virginia	6,976
Cecil County sheet, Maryland	2,000
Harford County sheet, Maryland	3,280

Derby loam.—This type is a mellow yellowish-brown to reddish-brown silty loam, 10 inches deep, grading almost imperceptibly into a rather heavy reddish-brown silty loam subsoil. Occupies rolling upland prairie and is well drained. A good soil for general agriculture. Corn and wheat the chief crops. Yield of corn 25 bushels and of wheat 18 bushels per acre.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	4.16	34.87	41.96	18.94
Subsoil	2	5.02	30.38	44.64	19.79

	Acres.
Wichita sheet, Kansas	20,416

Elmwood loam.—Dark-brown fine sandy loam, 2 feet in depth, overlying close, poorly drained clay. Level terraces along Connecticut River. Lacustrine deposit. Has very little present agricultural value on account of compact nature and poor underdrainage.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	2.93	38.16	51.60	3.69
Subsoil	1	4.21	77.35	11.68	4.00

	Acres.
Allegan County sheet, Michigan	3,810
Hartford sheet, Connecticut and Massachusetts	11,710

Fargo loam.—Surface soil consists of about 6 inches of black sandy loam. From 6 to 18 inches a black loam or light clay loam occurs, and from 18 to 33 inches a fine gray loam, sometimes silty. From 33 to 72 inches the material is of a fine sandy or silty loam texture. Occupies slight depressions and shallow swales. Usually well drained. Derived from lacustrine deposits. Well adapted to wheat, oats, flax, barley, and corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	4.90	55.48	25.50	13.54
Subsoil	2	3.85	63.43	15.72	16.49

	Acres.
Grand Forks sheet, North Dakota	12,352

Glenwood loam.—Loam 4 feet deep, underlain by clay. Level valley floor. Soil contains considerable alkali, and drainage is often poor, but when drained and free from alkali it is excellent for general farming purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	2.78	16.32	45.61	27.60
Subsoil	3	5.05	20.73	44.48	24.66

	Acres.
Sevier Valley sheet, Utah	12,100

Hagerstown loam.—Brown or yellow loam 12 inches deep, yellow clay loam to 24 inches, underlain by stiff, tenacious red clay. Rolling valley land. Found in the great valley of the Appalachian system. Derived from weathering of pure massive limestone. Typical corn land of central Pennsylvania, Maryland, and the Shenandoah Valley of Virginia. One of the best types of general farming lands in the Eastern States. Produces corn, tobacco, wheat, and grass.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	9.02	14.99	47.32	26.17
Subsoil	8	7.18	13.05	39.18	37.87

	Acres.
Bedford sheet, Virginia	40,520
Harrisonburg sheet, Virginia	11,776
Lancaster County sheet, Pennsylvania	45,000
Lebanon sheet, Pennsylvania	93,110
Waynesboro sheet, Virginia	19,008

Imperial loam.—A fine-grained, sticky loam without grit or sand, on an average 5 feet deep, underlain by clay or clay loam. A very fertile soil, but frequently contains an excess of alkali salts. Drainage of this soil is costly and difficult on account of its close grain. When free from alkali it is adapted to most of the crops suited to the climate, but as it is likely to pack, annual crops or cultivated crops will prove most profitable.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	.46	13.48	53.94	28.85
Subsoil	4	.78	7.85	56.79	30.10

	Acres.
Imperial sheet, California	30,410
Yuma sheet, Arizona	20,800

Janesville loam.—A fine brown loam 12 to 14 inches deep, underlain by a firm massive yellow loam of very uniform texture. Surface almost uniformly level; underdrainage good. Excellent grain and tobacco soil.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	2.14	6.68	70.63	20.20
Subsoil	3	2.46	7.79	73.65	15.81

	Acres.
Janesville sheet, Wisconsin	6,656

Jordan loam.—Loam 3 feet deep, underlain by stiff, tenacious clay. Level low-lying plains. Origin, lacustrine, or river deposits, in Salt Lake and Sevier counties, Utah. Generally contains alkali. When free from alkali and well drained this soil is good for alfalfa and grain crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	3.41	25.13	39.73	21.94
Subsoil	8	7.08	28.42	37.35	20.14

	Acres.
Salt Lake sheet, Utah	41,900
Weber County sheet, Utah	15,400

Kaskaskia loam.—Surface soil consists of a heavy brown loam 9 inches deep, containing much silt. The subsoil is a mottled gray and yellow silty loam. Occupies low alluvial bottoms; subject to overflow; poorly drained. Derived from alluvial sediments. Nearly all covered with forest. Corn and hay principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	3.29	10.14	56.26	30.62
Subsoil	4	4.17	11.48	54.56	29.71

	Acres.
Clinton County sheet, Illinois	24,576
St. Clair County sheet, Illinois	9,664

Lake Charles loam.—Dark brown, black, or bluish-black loam, carrying high percentage of organic material. At 14 inches subsoil of clay loam appears, underlain by mottled clay. Origin, local swamp areas, into which fine loam has drifted. A heavy soil, difficult to till. Properly cultivated makes an excellent rice land. A probable celery type.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	.93	21.55	51.15	23.15
Subsoil	2	1.56	24.99	46.67	24.29

	Acres.
Lake Charles sheet, Louisiana	1,770

Lintonia loam.—Brown, silty loam, 0 to 9 inches; yellow silt, 9 to 36 inches, underlain by drab clay at a depth of 3 or 4 feet. Slope in front of bluff. Rarely inundated, but subject to addition of material from bluff during winter rains. Cotton produces well. Adapted also to market gardening and fruit culture. In northern areas good yields of corn, wheat, oats, hay, and potatoes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	10	2.07	15.67	70.69	11.18
Subsoil	8	2.77	13.55	69.44	14.01

	Acres.
Bentonia sheet, Mississippi	9,280
Dubuque sheet, Iowa	22,272
St. Clair County sheet, Illinois	5,696
Smedes sheet, Mississippi	1,088
Tazewell County sheet, Illinois	29,056
Yazoo sheet, Mississippi	3,060

Maricopa loam.—Reddish loam, 3 to 6 feet in depth, underlain by loam containing layers of calcareous hardpan. Lower valley land. Colluvial soil, derived from finer waste of mountain slopes. Adapted to alfalfa and grain.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	7.48	32.96	26.29	27.30
Subsoil	3	8.43	38.81	26.53	21.86

	Acres.
Salt River Valley sheet, Arizona	20,650

Miami loam.—A brown loam soil, 0 to 10 inches deep, containing a small proportion of medium to coarse sand, which in local areas grades into gravel. The subsoil, from 20 to 40 inches, is a heavy brownish-yellow loam, beneath which is found a fine gravelly loam. Occurs as terraces along rivers and as low-lying areas between sand hills. Is a fair corn soil, producing from 35 to 45 bushels. Should be used for growing canning crops, such as sugar corn, green peas, tomatoes, etc. Pears, plums, and apples also do well.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	16	15.80	26.91	39.27	16.14
Subsoil	15	17.37	25.46	37.56	19.09

	Acres.
Columbus sheet, Ohio	26,880
Grand Forks sheet, North Dakota	17,728
Janesville sheet, Wisconsin	51,968
Lyons sheet, New York	5,184
Montgomery County sheet, Ohio	14,000
Tazewell County sheet, Illinois	34,560
Toledo sheet, Ohio	5,504

Norfolk loam.—Fine-grained sandy loam, 12 inches deep; reddish-yellow, sandy loam, 12 to 30 inches, underlain by red sand. Gently rolling land or flat tops of hills. Good land for small fruits, heavy truck, and tobacco.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	8.90	46.15	32.97	9.30
Subsoil	5	9.09	45.88	25.82	16.63

	Acres.
Calvert County sheet, Maryland	5,220
Prince George County sheet, Maryland	9,660
St. Mary County sheet, Maryland	8,500

Orangeburg loam.—A loose, dark sandy loam, or loam, from 10 to 20 inches deep, underlain by a sticky red sandy clay containing small gravel and iron concretions. Derived from Lafayette formation. Adapted to general farming and gives good yields of cotton, corn, and oats. Supposed to be adapted to Cuban filler tobacco.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	43.50	37.96	6.44	11.56
Subsoil	1	30.80	18.08	4.92	46.36

	Acres.
Darlington sheet, South Carolina	6,592

Oxnard loam.—Heavy, sticky brown or black loam, underlain at 3 or 4 feet by a compact and heavier phase of the same soil. Derived from wash from shales and sandstones, and laid down on delta plains. Adapted to barley and sugar beets. Frequently needs draining.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.46	18.01	38.18	35.63
Subsoil	2	1.10	24.15	38.21	31.14

	Acres.
Ventura sheet, California	6,830

Pastillo loam.—White, reddish, or brown loam, about 4 inches in depth, resting on porous limestone, fragments of which occur in soil. Affords scanty pasturage. Produces small amount of Guinea-grass on areas of deeper and more fertile soil. Occurs west of Ponce in the southern part of the Porto Rican area. Among the poorest soils of the area.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	2	11.99	16.44	45.77	25.24

	Acres.
Arecibo sheet, Porto Rico	16,040

Pecos gypsum.—Sandy loam or light loam soil, underlain by soft saccharoidal gypsum at a depth of 2 feet. Gypsum is often present at the surface. Level bench land. Derived from disintegration of gypsum deposits, and possesses remarkable power of transmitting seepage waters by capillarity and gravitational flow. With high salt content of irrigation water it is not desirable land for agricultural purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	2.39	49.64	23.19	17.58
Subsoil	5	2.86	27.29	18.66	37.76

	Acres.
Carlsbad sheet, New Mexico	11,630

Penn loam.—Is a dark Indian-red loam, 8 to 12 inches deep, underlain by Indian-red clay loam subsoil. Occasionally contains 5 to 20 per cent of sandstone fragments. Surface gently rolling. Derived from fine-grained brown or red sandstone (Triassic). The drainage is fair, but plowing in beds is generally practiced to assist the natural drainage. It is considered almost equal to associated limestone soils in fertility.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	10.54	16.12	51.64	20.16
Subsoil	6	11.54	16.37	47.36	24.83

	Acres.
Lebanon sheet, Pennsylvania	26,890
Trenton sheet, New Jersey	171,712

Ponce loam.—Is composed of a dark-brown alluvial loam 3 feet or more in depth. Originally swampy in part. When drained, well adapted to sugar cane and Guinea-grass, also to bananas and plantains. Best sugar land of the area. All under cultivation.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	1.78	19.98	57.46	20.06

	Acres.
Arecibo sheet, Porto Rico	2,480

Porters black loam.—Rich dark loam, 15 inches deep, mixed with rounded and angular fragments of rock, often several feet in diameter. Subsoil is a yellowish-brown or reddish clay loam, containing a large percentage of rocks. Steep slopes of higher mountains. Residual soil derived from granite, gneiss, and similar rocks. Fertile soil, but slopes are too steep and stony to admit of extensive cultivation for general farm crops. Especially adapted to apples.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	13	22.32	26.27	25.86	22.58
Subsoil	10	23.18	24.64	25.68	24.72

	Acres.
Bedford sheet, Virginia	8,270
Buckingham sheet, Virginia	28,736
Harrisonburg sheet, Virginia	18,112
Hickory sheet, North Carolina	64
Mount Mitchell sheet, North Carolina	87,808
Taylorsville sheet, North Carolina	448
Waynesboro sheet, Virginia	21,888

Porters loam.—A dark-red or gray loam, 6 to 15 inches deep. Subsoil is a tenacious red clay. Both soil and subsoil contain fragments of quartz and other rocks. Occupies mountain or high, rolling lands. Derived from igneous rocks. Wheat, corn, oats, rye, potatoes, and fruit are the principal crops. Encountered only in small areas and so far unmapped.

Redfield loam.—Vermilion-colored loam, 5 feet deep, underlain by clay to a considerable depth. Poorly drained soil, containing large quantities of alkali. Level valley floor. Excellent land for general farming purposes when drained and free from alkali.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	0.55	18.98	52.06	21.73
Subsoil	4	1.22	20.67	47.94	20.62

	Acres.
Sevier Valley sheet, Utah	14,100

Roswell loam.—Loam, 4 feet deep, underlain by clay loam and clay. Level, low bench land. Lacustrine deposit. Soil is naturally poorly drained and contains alkali, but when well drained and free from alkali it is recognized as good soil for general farm crops.

	Acres.
Roswell sheet, New Mexico	2,730

Salt Lake loam.—Loam, 2 feet deep, underlain by sandy loam. Level plains, representing recent lake bottom, poorly drained, containing excessive amounts of alkali. Soil is not adapted to agriculture at present on account of low-lying position, imperfect drainage, and high salt content.

	Acres.
Weber County sheet, Utah	9,600

Santiago loam.—Red loam, 3 feet deep; sandy loam to 4 feet, underlain by gravelly sandy loam. Harsh, compact soil washed from foothills by the streams; occurring along margin of coastal plain near foothills in southern California. Considered unproductive soil, and at present little used for agricultural purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	4.16	33.63	43.07	15.91
Subsoil	1	3.52	29.91	41.60	20.89

	Acres.
Santa Ana sheet, California	1,830

Sassafras loam.—Brown loam, 10 inches deep, underlain by heavy, yellow loam subsoil. Gently rolling upland in Cecil and Kent counties, Md., and level terraces in more southern counties of eastern shore; level or gently rolling terraces and level uplands in southern Maryland. Good land for general agricultural purposes. Terrace levels in New Jersey, where it attains its greatest value as a farm land, largely through a good system of cultivation. In New Jersey produces 25 to 35 bushels of wheat, 1 to 2 tons of hay, and 50 to 70 bushels of corn per acre. In Cecil, Kent, and Harford counties, Md., Sassafras loam produces 20 to 25 bushels of wheat, 40 to 60 bushels of corn, and about 1 ton of hay per acre. In Prince George, Calvert, and St. Mary counties it produces 12 to 18 bushels of wheat, 25 to 40 bushels of corn, and little hay; also produces fair tobacco. The differences of production depend largely on the method of cultivation.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	22	8.49	26.10	52.34	10.34
Subsoil	22	8.21	21.15	49.40	18.05

	Acres.
Calvert County sheet, Maryland	8,850
Cecil County sheet, Maryland	50,500
Darlington sheet, South Carolina	26,880
Harford County sheet, Maryland	29,810
Kent County sheet, Maryland	59,140
Prince George County sheet, Maryland	9,090
Salem sheet, New Jersey	64,930
St. Mary County sheet, Maryland	16,200
Trenton sheet, New Jersey	84,672

Sedgwick loam.—Consists of a fine, mellow reddish-brown loam, 10 inches deep, underlain by a heavy, somewhat tenacious brown loam containing considerable fine sand. Occupies rolling upland prairie, is easily cultivated, and usually well drained. Derived from unconsolidated material of Tertiary age. Adapted to ordinary farm crops, such as corn, wheat, oats, and kafir corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	9.41	20.71	59.62	9.86
Subsoil	3	10.52	18.51	56.59	13.88

	Acres.
Wichita sheet, Kansas	47,040

Utuado loam.—Dark-brown or yellowish loam, 7 inches deep, friable and free from stones, underlain by yellow loam becoming lighter in texture at lower depths. Derived from igneous and volcanic rocks. Occupies hilly country in vicinity of Utuado. Some areas adapted to coffee and fruit, but the greater part used for pasture.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	11.05	27.53	27.87	33.63
Subsoil	1	10.11	29.82	29.76	30.21

	Acres.
Arecibo sheet, Porto Rico	7,880

Vernon loam.—Surface soil is a fine-grained, reddish-brown to dark-brown loam, 12 inches deep, mellow and friable and easily worked. The subsoil is a light reddish-brown loam, heavier in texture than the soil. At from 3 to 6 feet it is underlain by red clay. Occupies level and slightly rolling areas of the prairie upland, is fairly well drained, and is derived from the weathering of material forming the Permian Red Beds. Corn, wheat, oats, kafir corn, and sorghum are the principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	2.61	25.73	59.70	11.66
Subsoil	3	2.58	23.19	59.15	14.76

	Acres.
Vernon sheet, Texas	59,392

Volusia loam.—A brown or black loam, 6 to 10 inches deep, resting on a yellow silty loam containing shale fragments and having a depth of 3 feet or more, in turn underlain by shale rock. The surface is strewn with shale and slate fragments and occasional erratic glacial bowlders. Occurs typically developed upon heavy rolling uplands, but extends down into the foreland along the lake. Derived from morainic material. Crops: Wheat, corn, and at lower elevations grapes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	3.19	20.18	45.66	24.53
Subsoil	2	10.12	19.24	43.31	20.55

	Acres.
Westfield sheet, New York	10,030

Walla Walla loam.—This type consists of a very sticky brown or black sandy loam, or loam, with a depth of 3 feet, underlain by a sandy loam similar to the subsoil of the Yakima sandy loam. In places this subsoil from 3 feet to 6 feet may be a sticky, yellow plastic sandy loam, but in most cases below 3 feet the soil is an ordinary

sandy loam. Occupies the very high, steep hills in the eastern part of the district mapped. Is especially adapted to wheat and barley, giving very large yields of both.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	1.37	15.19	69.49	13.71
Subsoil	3	2.67	20.04	66.43	10.20

	Acres.
Walla Walla sheet, Washington	23,360

Yakima loam.—Loamy soil 2 to 6 feet in depth, sometimes overlying sandy loam or sand, but often resting directly on coarse gravel. Not well drained. Usually free from alkali. Alluvial soil. Hay and pasture land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	2.15	18.64	60.12	13.45
Subsoil	2	6.95	25.50	54.01	16.48

	Acres.
Caldwell sheet, Idaho (mapped as Caldwell loam)	1,500
Walla Walla sheet, Washington	3,392

Yazoo loam.—Yellow or brown loam or silt loam, 0 to 6 inches, drab clay or fine compact sandy loam 6 to 40 inches. Low ridges in river deltas. Represents higher-lying areas of fine sediment deposited by inundations. Strong cotton soil, producing 1 bale per acre. In northern areas adapted to corn and wheat.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	3.65	23.89	56.97	14.49
Subsoil	7	3.16	17.58	57.96	19.41

	Acres.
Bentonia sheet, Mississippi	3,712
Clay County sheet, Illinois	1,472
Posey County sheet, Indiana	8,320
Mayersville sheet, Mississippi	4,240
St. Clair County sheet, Illinois	4,160
Smedes sheet, Mississippi	16,576
Yazoo sheet, Mississippi	11,840

SHALE LOAM.

Cardiff slate loam.—Heavy yellowish-brown loam, having a depth of 8 or 10 inches, underlain by heavy yellow silty clay to a depth of 3 feet or more. Both soil and subsoil contain from 15 to 40 per cent of partially decomposed slate fragments. Formation occurs on prominent narrow ridges. Derived from the decomposition and breaking up of fine-grained slate. The presence of the slate fragments in the soil makes quite friable what would otherwise be a refractory clay. Much of the area is forested with oak, chestnut, and other trees. Produces fair crops of corn, wheat, rye, oats, and grass.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	3.26	4.06	55.60	30.99
Subsoil	1	5.42	7.46	52.50	28.82

	Acres.
Harford County sheet, Maryland	1,690

Dunkirk shale loam.—Brown or gray loam, about 7 inches deep, underlain by mottled clay to a depth of 1 to 3 feet. Surface in most places covered with shale fragments from 1 to 4 inches in diameter. Located on escarpment and the steeper slopes. Residual soil derived from shale. Generally covered with timber and underbrush. Less steep positions under vineyards.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	3.72	18.50	40.86	32.21
Subsoil	1	6.32	7.18	30.10	50.11

	Acres.
Westfield sheet, New York	21,860

Elmira shale loam.—Light gray loam, 10 or more inches in depth, containing considerable silt and fine sand. The subsoil, from 10 to 24 inches below the surface, is of the same texture as the soil, but lighter in color, and contains large quantities of angular shale fragments or bowlders. All general farm crops are raised, but to obtain the best results a liberal application of manure is required.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	3	9.33	23.71	50.66	15.96

	Acres.
Bigflats sheet, New York	8,512

Hagerstown shale loam.—Loam 12 inches deep, containing 20 to 60 per cent of fragments of shale, resting upon a mass of broken shale. Ridges in limestone valley. Thin, dry soil, derived from disintegration of shales, requiring very thorough cultivation, but when so cultivated adapted fairly well to general agricultural purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	13	14.33	11.94	42.20	28.81
Subsoil	6	11.58	13.12	41.93	31.75

	Acres.
Bedford sheet, Virginia	25,370
Bigflats sheet, New York	108,800
Buckingham sheet, Virginia	20,096
Harrisonburg sheet, Virginia	31,296
Lancaster County sheet, Pennsylvania	15,000
Lebanon sheet, Pennsylvania	142,210
Waynesboro sheet, Virginia	23,936

Salinas shale loam.—Very light chalk-like loam, 5 to 6 feet in depth, grading into loam of texture of Oxnard loam. Light, friable, and easily cultivated; sometimes contains large percentage of light siliceous gravel, derived from the beds of bituminous shale of Miocene age. Occurs on level, gently sloping plains near mountains.

Always well drained and free from alkali. Adapted to Lady Washington and black-eyed beans and barley.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	3	4.01	20.66	50.79	20.45

	Acres.
Soledad sheet, California	13,730
Ventura sheet, California	2,544

SILT LOAM.

Alamance silt loam.—Yellowish-gray silt loam, 8 inches deep, underlain by heavy yellow clay. Clay content increases in lower depths. Both soil and subsoil contain fragments of broken rock. Occupies rolling lands. Residual soil derived from decomposition of highly metamorphosed crystalline rocks. Area largely forested. Fair land for cotton, corn, and wheat. Should have been called Cecil silt loam, as it belongs to this series.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	8.02	10.03	68.41	9.95
Subsoil	2	4.16	4.34	49.83	36.19

	Acres.
Alamance County sheet, North Carolina	7,860

Almyra silt loam.—Mottled, grayish-brown silty loam about 12 inches deep, resting on material of the same general character, though lighter in color, and grading by degrees through a whitish silt into a reddish-brown clay. Subsoil contains iron concretions and is stained with iron. Occupies level and depressed areas of prairie upland. Poorly drained and difficult to till. Native vegetation a scattered growth of scrub oak near forested areas, elsewhere coarse prairie grasses. With proper tillage good yields of oats, corn, cowpeas, sorghum, and kafir corn are obtained. At present used principally for pasture and wild hay.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	2.02	8.66	74.16	15.96
Subsoil	3	2.33	3.67	75.03	18.78

Acres.

Stuttgart sheet, Arkansas 63,104

Arecibo silt loam.—Dark brown silt loam 12 to 36 inches deep, underlain by dark loam or silt loam. Alluvial deposit occupying low level areas along or near the coast. In the vicinity of Arecibo excellent cane land, producing from 30 to 40 tons per acre. Around Ponce, low-lying and too alkaline for crops on account of occasional inundation by sea water.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	2.68	17.74	54.92	24.23
Subsoil	3	2.71	13.70	52.18	30.69

Acres.

Arecibo sheet, Porto Rico 8,960

Clarksville silt loam.—Yellowish-gray silt loam, 7 inches in depth, underlain by brownish-yellow, heavy silt loam to a depth of 24 inches, overlying heavy red clay loam 3 feet or more in depth. Deep subsoil often contains fragments of chert. Residual soil derived from limestone, or loess covering over limestone. Well drained. Naturally strong, fertile soil, but needs careful treatment to maintain fertility. Well adapted to corn, wheat, and grass.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	4.76	17.03	64.85	16.45
Subsoil	7	3.71	9.44	50.29	34.15

	Acres.
Clarksville sheet, Tennessee	233,410
Howell County sheet, Missouri	40,384

Delavan silt loam.—Is a brown, smooth, crumbly, nonplastic silt loam, 12 inches deep, underlain by a reddish-yellow heavier silt loam, which in turn is underlain by a fine sand at from 65 to 75 inches. Occurs principally in the southwestern part of Tazewell County. Is level and does not require artificial drainage. An exceedingly fertile soil, very highly esteemed for corn and small grain.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.89	7.84	69.34	20.78
Subsoil	2	1.19	11.68	74.52	12.32

	Acres.
Tazewell County sheet, Illinois	25,600

Edgerton silt loam.—A very fine, yellowish sandy and silty loam, about 12 inches deep, underlain by yellow silty clay. The surface soil is friable when dry. The line between soil and subsoil is quite distinct. The type as a whole is well drained. Eminently adapted to farm crops and fruit. Produces large yields where properly cultivated.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	1.82	8.48	75.58	13.36
Subsoil	6	1.13	6.56	71.25	20.55

	Acres.
Clinton County sheet, Illinois	9,920
Jamesville sheet, Wisconsin	81,216

Elmira silt loam.—A pale yellow to light brown silt loam 6 to 12 inches deep, containing a comparatively high percentage of very fine sand. The subsoil consists of a brown or chocolate loam, slightly heavier in texture. Occupies rolling forelands of Lake On-

tario, and the tablelands and ridges of Sodus Bay, and in the Chenung Valley. Generally has good natural drainage. Of sedimentary origin. Free from stones or gravel and easily tilled. Wheat, oats, corn, potatoes, hay, and fruit are the principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	2.80	19.78	60.30	16.68
Subsoil	6	1.72	16.76	65.33	15.38

	Acres.
Bigflats sheet, New York	1,920
Lyons sheet, New York	28,096

Glendale loess.—Silt 6 feet or more in depth, typical loess texture. Level plain, forming low divide between Salt River and Agua Fria River, Arizona. Formed by wash from Cave Creek. Generally well drained and free from alkali. Adapted to grain and alfalfa; lighter phases to fruit growing.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	20.37	26.57	42.27	23.16
Subsoil	2	3.38	41.26	38.93	12.05

	Acres.
Salt River Valley sheets, Arizona	52,040

Janesville silt loam.—The surface soil is a mealy, chocolate-colored silt loam about 10 inches deep, which has a deep reddish-brown color when wet. This is underlain to a depth of 40 inches or more by a sticky reddish-yellow silty clay, resting upon gravel or limestone rock. Throughout the area are found small hills of gravel and sand. Well drained. Owes its origin to glacial deposits. Corn, wheat, oats, and tobacco grown with good results.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	4.55	10.50	67.62	16.21
Subsoil	4	2.79	9.47	73.01	14.25

	Acres.
Janesville sheet, Wisconsin	81,344

Leonardtown loam.—Yellow silty loam, closely resembling loess, 9 inches deep, underlain by red and mottled clay loam with peculiar interlocking clay lenses and pockets of sand. Slightly rolling upland. Good soil for general farming, wheat, and grass land. Much of the area is waste land or grown up in white oak and pine forests, and some of the more level portions need underdrainage. This soil is deficient in organic matter and lime.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	11	6.20	22.48	53.98	14.22
Subsoil	11	4.98	18.92	48.77	22.03

	Acres.
Calvert County sheet, Maryland	7,950
Prince George County sheet, Maryland	45,770
St. Mary County sheet, Maryland	95,500

Marion silt loam.—Consists of fine sand or silt of gray or yellowish-white color, with an average depth of 12 inches. Subsoil consists of a hard, stiff silty clay of mottled appearance, the predominating colors being gray, light yellow, and reddish yellow. Occupies the level prairie land. Of loessial origin. Hardpan is found under most of the area at depths varying from 14 inches to 2 or 3 feet. Wheat is the principal crop. Yield of grains rather small. Apples do very well.

Description.	No. of samples.	1	2	3	4
Soil	9	2.92	7.15	75.66	13.78
Subsoil	13	3.31	7.46	63.30	25.69

Average mechanical analyses.

	Acres.
Clay County sheet, Illinois	260,544
Clinton County sheet, Illinois	172,480
St. Clair County sheet, Illinois	86,464

Memphis silt loam.—Fine yellow or brown silt loam, 0 to 8 inches, powdery when dry; chocolate-brown loam 8 to 40 inches, underlain at from 2 to 6 feet by yellow silt of loess formation. Uplands of Mississippi. Subject to serious erosion. Only about 20 per cent of total area cultivated. Largely forested to oak, hickory, and beech. Divided topographically into two regions: The Cane Hills, which are steep sided and narrow topped, and the Flat Hills, which are more plateau-like and cultivated to a greater extent than the Cane Hills. Cotton three-eighths to one-half bale per acre.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	0.88	4.63	82.74	10.29
Subsoil	8	.86	5.92	77.78	11.00

	Acres.
Bentonia sheet, Mississippi	52,160
Posey County sheet, Indiana	9,408
Smedes sheet, Mississippi	128
Union County sheet, Kentucky	17,984
Yazoo sheet, Mississippi	140,090

Miami silt loam.—A dark-brown, ash-colored silty and fine sandy loam about 18 inches deep, with a subsoil of yellow or mottled yellow silty clay loam, in which silt is very prominent. Occupies level to gently rolling prairies. Naturally poorly drained. Derived, by weathering, from loesslike material. Wheat, corn, oats, and grass produce good yields.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	19	1.80	8.83	74.97	13.76
Subsoil	19	1.90	9.44	70.12	19.48

	Acres.
Clinton County sheet, Illinois	57,472
Dubuque sheet, Iowa	176,896
Posey County sheet, Indiana	149,376
St. Clair County sheet, Illinois	106,432
Tazewell County sheet, Illinois	224,960
Union County sheet, Kentucky	154,176

Oxnard silt loam.—Brown, friable silt loam, 6 feet or more in depth, derived from finer sediments of streams draining sandstone areas, mixed with particles of organic matter. Occurs on level delta plains. Adapted to lima beans, corn, and barley without irrigation, and to lima beans, walnuts, and deciduous and citrus fruits when irrigated. Well drained and free from alkali salts.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	1.72	15.69	41.08	35.54

	Acres.
Ventura sheet, California	5,320

Santiago silt loam.—Silt loam is a dense, heavy soil, resembling adobe, 2 feet in depth, very sticky when wet, underlain by sand, fine sand, or fine sandy loam. Lower delta plains and river terraces. Derivation from modern alluvium, often being deposited at present during flood season. When well drained and free from alkali this soil is adapted to fruit, celery, and sugar beets. It is dry farmed to wheat to some extent, and as occurring in the Salinas Valley is considered a most valuable soil.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	4.86	21.86	50.11	20.01
Subsoil	4	12.59	35.09	37.69	11.99

	Acres.
Holly sheet, Colorado	9,728
Lamar sheet, Colorado	12,608
Las Animas sheet, Colorado	8,640

	Acres.
Rockyford sheet, Colorado	6,784
Salinas sheet, California	3,910
San Gabriel sheet, California	5,220
Santa Ana sheet, California	14,349
Soledad sheet, California	10,210
Yuma sheet, Arizona	3,763

Selma heavy silt loam.—Heavy silt loam, 20 inches or more in depth, underlain by a stiff, mottled clay. Low-lying level tracts in Coastal Plain region. Natural drainage is poor, and for this reason the soil is unproductive, but when drained it is good cotton and grass land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	11.94	43.69	28.61	13.62
Subsoil	4	16.20	32.44	20.58	27.73

	Acres.
Clayton sheet, North Carolina	4,650
Darlington sheet, South Carolina	15,488
Kinston sheet, North Carolina	350
Newbern sheet, North Carolina	3,300
Princeton sheet, North Carolina	13,980

Selma silt loam.—Occurs in large areas in the Atlantic Coastal Plain. The surface is generally rolling, with numerous fine sandy knolls and ridges. It is well drained. The soil consists of about 18 inches of silt mixed with fine sand, resting on a silty loam subsoil. The sandy knolls and ridges are especially suited to the production of bright tobacco, while the lower lying siltier portions produce cotton, corn, tobacco, and truck. Should have been called Norfolk silt loam, as it belongs in that series.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	54.56	38.52	13.25	3.72
Subsoil	1	36.49	27.38	11.57	21.26

	Acres.
Clayton sheet, North Carolina	11,780
Kinston, sheet, North Carolina	25,440
Princeton sheet, North Carolina	75,450

Vernon silt loam.—A silt loam about 10 inches deep, underlain by a loose, yellow sand. Occurs upon river flats, usually near bluff line. Poorly drained. Formed by deposits from river. At present used only for pasturage and of little agricultural value.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.25	31.24	56.33	11.02
Subsoil	2	2.69	37.86	46.91	12.16

	Acres.
Vernon sheet, Texas	2,880

Waverly silt loam.—A silty brown loam about 10 inches in depth, underlain by a grayish or yellowish silty loam containing a larger proportion of clay. Occupies bottom lands and marshy depressions. Owes its origin to sediments washed from adjoining prairies, reworked with organic matter. Corn principal crop.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	12	1.90	9.93	72.59	15.29
Subsoil	12	2.18	9.20	71.89	16.51

	Acres.
Clay County sheet, Illinois	30,976
Clinton County sheet, Illinois	42,112
Posey County sheet, Indiana	16,384
St. Clair County sheet, Illinois	25,152
Union County sheet, Kentucky	25,216

Yakima silt loam.—A grayish blue, brown, or black loam, ranging from a fine sandy to a heavy silty texture, and about 10 inches deep, underlain by a dark-gray or bluish loam with adobe tendencies. This is in turn underlain by a lighter material, occasionally

of a yellowish cast, containing some sand. Occupies valleys and is generally quite level. Formed by weathering of sediment washed from hills of Yakima fine sandy loam. Wheat forms the principal crop. Timothy, barley, oats, and alfalfa are also grown.

Average mechanical analyses.

Description.	No of samples.	1	2	3	4
Soil	3	3.92	11.84	68.64	12.18
Subsoil	3	2.85	18.93	64.01	13.96

	Acres.
Lewiston sheet, Idaho	15,936

CLAY LOAM.

Clarksville clay loam.—Heavy reddish-brown loam, 8 inches deep, underlain by heavy red clay loam to depth of 3 feet or more, clay content increasing at lower depths. Typically developed in northern portion of Montgomery County, Tenn., along Kentucky boundary line. Gently undulating country, usually well drained. Deep residual soil derived from decomposition of limestone. On account of scarcity of timber at time of discovery has always been known as the "Barrens." Strong, fertile soil, considered best general farm land of the locality. Tobacco of the export variety produces heavy yield, but not a superior quality of leaf.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	2.35	5.96	71.46	16.25
Subsoil	2	1.17	4.22	65.46	24.73

	Acres.
Clarksville sheet, Tennessee	27,460

Davie clay loam.—Pale yellow loam, 6 inches in depth, underlain by pale yellow friable clay which becomes red and heavier in texture in lower depths. Soil and subsoil contain small amounts of

broken quartz fragments. Level or gently rolling uplands. Derived from decomposition of talc schists and similar rocks. Area mostly forested. Produces fair crops of wheat, corn, and tobacco.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	7.03	39.81	36.29	13.70
Subsoil	3	3.32	24.06	28.72	41.38

	Acres.
Abbeville sheet, South Carolina	25,856
Statesville sheet, North Carolina	3,370

Hagerstown clay loam.—Heavy reddish clay loam, 24 inches deep, overlying stiff, tenacious red clay. Rolling valley land. Derived from weathering of pure massive limestone. Recognized as one of the strongest soils for general agricultural purposes. Well known for large crops of wheat and corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	5.24	11.71	59.19	19.08
Subsoil	2	7.05	14.67	47.28	25.79

	Acres.
Lancaster County sheet, Pennsylvania	21,000

Iredell clay loam.—Dark-brown loam, 8 inches in depth, containing small rounded iron concretions on the surface. Subsoil is stiff, impervious yellow clay 24 inches deep, underlain by soft decomposed rock. Level or slightly rolling areas. Residual soil derived from diorite and similar eruptive rocks. Known as "black-jack" or "beeswax" land. In level areas inclined to be swampy on account of impervious nature of clay subsoil. Considered poor cotton, corn, and wheat land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	8	20.28	40.06	28.55	9 08
Subsoil	8	4.99	17.96	25.83	46.24

	Acres.
Abbeville sheet, South Carolina	10,752
Alamance County sheet, North Carolina	18,760
Due West sheet, South Carolina	4,096
Prince Edward sheet, Virginia	103,070
Statesville sheet, North Carolina	22,340

Lacasine clay loam.—A heavy brown or black clay loam, 20 inches deep, grading into mottled clay—blue generally predominating. Subsoil contains some silt, iron nodules, and sometimes lime concretions. Found in depressions in large swamp areas free from hummocks. A heavy soil, difficult to till and poorly drained, but with lasting properties. This type has no agricultural importance.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	1.73	23.42	53.37	17.87
Subsoil	3	.31	16.53	55.90	24.39

	Acres.
Lake Charles sheet, Louisiana	3,470

Lickdale clay loam.—Is a silty loam, 6 to 10 inches in depth, underlain by a mottled yellow clay. It occurs in small extent at the foot of the Blue Ridge Mountains, and is derived from the wash of the mountains and the adjacent shale formations. Sometimes fragments of gray sandstones are present to the extent of from 5 to 20 per cent. It is low-lying, flat land, and poorly drained. Naturally it is very refractory and is suited only to grass and pasture, but when artificially drained it becomes mellow and produces quite a wide range of crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	12.30	9.32	43.84	13.42
Subsoil	1	14.88	7.04	32.54	41.43

	Acres.
Lebanon sheet, Pennsylvania	3,920

Maricopa clay loam.—Stiff reddish clay loam, 6 feet or more in depth. Low valley land. Colluvial soil, heaviest product of the wash from the mountain slopes. Adapted to grain crops, but rather heavy and compact for alfalfa.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	10.04	21.04	37.64	31.24
Subsoil	1	1.68	15.46	53.42	29.44

	Acres.
Lamar sheet, Colorado	512
Rockyford sheet, Colorado	320
Salt River Valley sheets, Arizona	8,713

Miami black clay loam.—Black clay loam, 8 to 12 inches deep, underlain by same material, which is heavier and more tenacious, occupying slight depressions in uplands and prairies. Glacial origin. Areas generally level, naturally poorly drained, and formerly swamps in which water stood during the greater part of the year. When thoroughly drained this soil is very productive for general farm crops. This is the black prairie soil of the middle West. It is well adapted to grass and wheat but is particularly fine for corn.

Average mechanical analyses.

Description,	No. of samples.	1	2	3	4
Soil	17	5.27	15.05	58.51	18.82
Subsoil	20	2.38	9.03	63.60	23.66

	Acres.
Allegan County sheet, Michigan (mapped as Allegan black clay)	12,460
Columbus sheet, Ohio	33,792
Grand Forks sheet, North Dakota	44,352
Janesville sheet, Wisconsin	1,856
Montgomery County sheet, Ohio	18,000
Tazewell County sheet, Illinois	61,184
Toledo sheet, Ohio	165,056

Miami clay loam.—Light-colored loam, 12 inches deep, underlain by a clay loam, which in turn is underlain by bowlder clay at a depth of 5 feet. Level plains, except adjacent to the streams. Glacial origin. The surface of the country was formerly covered by bowlders, which have largely been removed. One of the best of soils for general agricultural purposes, especially wheat.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	17	5.71	16.71	56.57	19 26
Subsoil	15	4.83	14.65	50.09	29.34

	Acres.
Allegan County sheet, Michigan (mapped as Allegan clay)	107,850
Columbus sheet, Ohio	222,336
Montgomery County sheet, Ohio	240,000
Stuttgart sheet, Arkansas	69,696
Toledo sheet, Ohio	20,352

Murrill clay loam.—Yellowish-brown clay loam, 10 inches deep, overlying yellow clay loam, increasing in clay content in lower depths. Both soil and subsoil often contain small fragments of shale and chert. Derived from weathering of shales and cherty limestone. Rolling valley lands. Fertile soil; produces good crops of wheat, corn, grass, dark manufacturing tobacco, and apples.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	13.01	14.53	41.83	26.70
Subsoil	3	11.58	11.16	29.55	43.53

	Acres.
Bedford sheet, Virginia	15,720

Redfield clay loam.—Clay 5 feet in depth, underlain by sand. Clay is quite tenacious and difficult to till. Poorly drained soil, containing considerable alkali. Low and level valley land. Of little agricultural value except as meadow land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.31	9.76	52.79	26.49
Subsoil	4	.25	8.87	51.32	29.90

	Acres.
Sevier Valley sheet, Utah	3,800

Sedgwick black clay loam.—A fine-grained black silty loam, 12 inches deep, underlain by a tough, heavy bluish-gray to drab clay extending to a depth of 3 feet or more. Occupies flat or depressed areas on upland prairie, and is poorly drained. Formed from wash from the surrounding soils. Generally used only for pasture, although thorough drainage converts it into land well adapted to wheat and corn.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	2.64	39.06	48.08	9.14
Subsoil	1	1.24	16.54	51.60	30.94

	Acres.
Wichita sheet, Kansas	5,568

Sedgwick clay loam.—A chocolate-brown to dark-brown friable silty loam about 9 inches deep; from 9 to 20 inches it grades from a heavy brown clay loam to a dark-brown clay; from 20 to 36 inches it becomes lighter in color and more silty. When wet the soil is very sticky, and in drying forms a thin crust on the surface. Occupies a high rolling prairie and is well drained. Derived from the weathering of Carboniferous limestones and shales. Adapted to the production of corn, wheat, hay, fruit, and vegetables.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	3.39	13.47	70.45	12.53
Subsoil	3	2.43	8.49	71.89	16.85

	Acres.
Wichita sheet, Kansas	136,320

Susquehanna clay loam.—Sandy loam or sand about 10 inches deep, underlain by a heavy mottled clay subsoil identical with Susquehanna clay. Occupies hills, slopes, and valleys. Adapted to grain and grass crops. Considerable areas yet in oak and pine forest.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	6.83	16.71	50.24	20.78
Subsoil	1	2.62	10.96	55.26	26.31

	Acres.
Prince George County sheet, Maryland	16,850

CLAY.

Adjuntas clay.—A red or dark-brown clay 3 to 15 inches deep, underlain by red clay 36 inches or more in depth. Derived from volcanic and igneous rocks. Occupies steep slopes. Difficult or impossible to till, requiring great care to prevent washing. The principal and most important coffee soil of the Arecibo to Ponce area. Also adapted to the growth of bananas, plantains, and oranges, where there is a sufficient depth of soil.

Average mechanical analyses.

Description.	No. of Samples.	1	2	3	4
Soil	3	2.45	6.48	35.66	51.51
Subsoil	2	2.04	10.30	43.75	43.23

	Acres.
Arecibo sheet, Porto Rico	29,890

Alloway clay.—Red or gray clay loam 6 inches deep, containing some gravel, underlain by a mottled yellow and gray sticky clay to a depth of 3 feet or more. Rolling upland or bottoms. Derived from Miocene—recent sediments. Good grass and wheat lands. Produces fine apples. Difficult to till.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	7.20	14.41	42.05	34.26
Subsoil	5	9.48	13.18	51.30	23.45

	Acres.
Lyons sheet, New York	16,448
Salem sheet, New Jersey	10,580
Trenton sheet, New Jersey	11,904

Alonso clay.—Dark purplish-red clay loam 8 to 28 inches deep, underlain by dark to purplish-red tenacious clay 36 inches or more in depth. Derived from igneous and volcanic rocks. Heavy, stiff, and hard to cultivate. Rough, mountainous topography. The small area southwest of Adjuntas is well adapted to oranges and coffee. The other areas are lower and produce chiefly bananas and plantains, with some coffee.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	10.13	21.40	30.58	36.76
Subsoil	2	4.18	15.19	36.94	43.54

	Acres.
Arecibo sheet, Porto Rico	13,690

Billings clay.—Consists of a loam 0 to 12 inches deep, underlain by a tough, sticky, impervious dark-gray to black loam 3 to 12 feet deep. Formed by disintegration of Fort Benton shale. The surface becomes very hard when dry and the type is difficult to till. Best adapted to grass for pasturage and hay.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.10	20.66	41.44	36.05
Subsoil	4	1.74	16.86	37,59	43.45

	Acres.
Billings sheet, Montana	17,088

Cecil clay.—Clay soil of reddish color, 6 inches deep; stiff tenacious clay subsoil, of red color, both soil and subsoil containing quartz and fragments of undecomposed rock. Occasional rock areas and isolated bowlders, or "niggerheads." High rolling land. Derived from gabbro and other eruptive rocks. Occurs in the Piedmont Plateau. Recognized as strongest soil of this region for general farming purposes. Adapted to grass, wheat, and corn in Maryland and Pennsylvania; export tobacco and wheat in Virginia; and to corn, wheat, and cotton in the Carolinas.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	31	16.68	26.37	27.18	27.63
Subsoil	38	9.90	17.46	25.46	41.84

	Acres.
Abbeville sheet, South Carolina	194,112
Alamance County sheet, North Carolina	101,370
Bedford sheet, Virginia	142,730
Buckingham sheet, Virginia	53,632
Cary sheet, North Carolina	2,960
Cecil County sheet, Maryland	12,500
Clayton sheet, North Carolina	2,030
Cobb County sheet, Georgia	166,130
Covington sheet, Georgia	99,930
Due West sheet, South Carolina	138,880
Harford County sheet, Maryland	39,890
Harrisonburg sheet, Virginia	1,344
Hickory sheet, North Carolina	86,784
Prince Edward sheet, Virginia	31,590
Statesville sheet, North Carolina	289,590
Taylorsville sheet, North Carolina	33,920
Waynesboro sheet, Virginia	24,704

Conestoga clay.—A yellowish to dark-brown clay loam about 7 inches deep, underlain by a yellow to reddish-yellow tenacious clay, usually not exceeding a depth of 24 inches. On ridges the rock is usually found at an average depth of 10 inches. Occupies the lower and gently rolling portions of the valleys. Higher areas well drained. Of residual origin from limestone schist. Wheat and grass principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	8.94	6.82	43.13	40.97
Subsoil	3	6.63	4.83	23.85	37.19

	Acres.
Harrisonburg sheet, Virginia	12,224
Waynesboro sheet, Virginia	4,736

Conowingo clay.—Heavy loam or red clay, 3 feet or more in depth. High, rolling land of Piedmont Plateau. Derived from decomposition of serpentine, steatite, and similar rocks; typically developed in Cecil County, Md. Generally strong and productive soil for general agricultural purposes. The difference in texture and agricultural value between this type and the Conowingo barrens has never been satisfactorily explained.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	18.61	29.11	34.77	21.01
Subsoil	7	20.03	17.41	27.60	32.01

	Acres.
Buckingham sheet, Virginia	6,272
Cecil County sheet, Maryland	3,000
Harford County sheet, Maryland	6,510
Taylorsville sheet, North Carolina	29,952

Dunkirk clay.—Soil is clay loam 6 to 12 inches in depth, underlain by a tenacious mottled clay, beneath which, at a depth of 4 to 10 feet, occurs the typical bowlder clay. Near ancient beach lines the

soil is sometimes underlain by gravel. Found upon lake foreland and in upland valleys. Derived from deposition in quiet water. Some areas badly drained. Adapted to grapes, grain, and grass.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	19.44	10.16	29.78	34.19
Subsoil	2	3.64	11.61	44.28	34.78

	Acres.
Westfield sheet, New York	23,490

Elkton clay.—Brown loam 9 inches deep; subsoil is heavy mottled yellow and gray clay loam containing some silt. It is of a dry nature, rather than plastic. Flat areas occurring in lowest Columbia terrace in Cecil and Kent counties, Md., and in similar positions in other areas in Atlantic Coastal Plain. Recognized as good land for general farming purposes when well drained; frequently needs artificial drainage.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	6.38	19.39	56.00	14.11
Subsoil	7	3.38	19.40	51.36	22.58

	Acres.
Cecil County sheet, Maryland	7,000
Harford County sheet, Maryland	11,370
Kent County sheet, Maryland	27,840
Prince George County sheet, Maryland	1,450
Salem sheet, New Jersey	11,240

Galveston clay.—Soil varies from a drab to a yellow clay, and rests on a clay subsoil of still heavier clay. Both soil and subsoil usually contain calcareous nodules. Country very level, flat. Drainage poor, representing the type of salt marsh extensively developed along the Gulf coast. Vegetation almost entirely salt grass, affording a rather poor pasturage.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.36	8.80	37.58	51.41
Subsoil	2	.64	5.82	47.93	43.94

	Acres.
Brazoria sheet, Texas	31,168

Griffin clay.—A very compact soil, composed of medium to fine gravel, coarse sand, rounded by water action, and clay. The clay is dark brown or mottled in color, very stiff and waxy, and difficult to work. There is an average gravel content of about 10 per cent. Occupies the broad, level floor of Black River Valley. Alluvial in origin, and the presence of so much gravel may be due to the reworking of glacial material. A large proportion of the type is covered by forest. Corn is the chief product, but considerable areas are devoted to wheat and oats.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	1	32.88	16.70	25.46	24.64
Subsoil	1	37.02	16.50	20.24	26.28

	Acres.
Posey County sheet, Indiana	1,600

Guthrie clay.—Soil is a light gray or grayish-white fine silty loam, having a depth of 7 inches, underlain by a heavy silty clay, plastic and impervious. The subsoil varies in color from a gray to drab, mottled with yellowish iron stains. Occupies low, flat areas on the uplands. Soil is derived from decomposition of limestone. On account of low, wet condition, it is of little agricultural value unless thoroughly drained. In favorable seasons some corn and tobacco are grown. Area largely covered by hickory, sweet gum, and oak. Land generally referred to as "crawfishy."

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	2.79	8.22	65.73	21.79
Subsoil	6	2.86	7.90	60.25	27.44

	Acres.
Clarksville sheet, Tennessee	5,800
Posey County sheet, Indiana	14,592
Stuttgart sheet, Arkansas	27,904

Hagerstown clay.—Heavy red loam 12 inches deep, underlain by stiff, tenacious red clay. Rolling valley land. Derived from weathering of pure massive limestone. Central Pennsylvania and Shenandoah Valley of Maryland and Virginia. Recognized as one of the strongest soils for general agricultural purposes.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	6.22	13.37	53.26	24.58
Subsoil	6	2.86	8.26	34.14	52.05

	Acres.
Bedford sheet, Virginia	19,210
Harrisonburg sheet, Virginia	25,920
Lancaster County sheet, Pennsylvania	2,000

Houston black clay.—Drab to black clay, 4 to 6 inches deep, friable when well cultivated, but becoming waxy and sticky when wet, and if not continually cultivated caking into a very hard and compact mass that cracks into irregular blocks on drying. Subsoil a waxy, very stiff, and tenacious clay of same color as soil. Both soil and subsoil contain varying quantities of carbonate of lime concretions, ranging generally from 1 to 10 millimeters in diameter, but frequently larger. Pockets of quartz are also found, and pockets of the drab soil in the black, and vice versa. Type occurs on treeless prairies in Texas, also in Alabama as the black calcareous prairie. Will undoubtedly be found in other Southern States. Very fertile soil. Used commonly for corn, cotton, and rice according to locality, elevation, and drainage. Probably also adapted to grass.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	6	2.10	25.30	46.47	23.09
Subsoil	6	1.71	14.43	51.95	25.15

	Acres.
Alvin sheet, Texas	209,408
Brazoria sheet, Texas	63,168
Willis sheet, Texas (mapped as San Jacinto clay)	20,480

Houston clay.—A brown or black clay loam from 4 to 8 inches deep, grading into a yellow clay subsoil of a stiff and plastic character and underlain by blue or gray clay. Occupies level or gently rolling country, usually prairie, and owes its origin to Cretaceous sediments. One phase of the black calcareous prairie. Cracks in summer, but is very plastic when wet. Cotton principal product. Adapted to stock raising. Corn and oats do well.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	11.84	21.63	41.71	24.61
Subsoil	3	1.81	11.32	39.38	47.07

	Acres.
Perry County sheet, Alabama	136,128

Imperial clay.—Soil is a heavy clay loam or clay, having a depth of 6 feet or more. Surface usually level, though in places small dunes are seen. Derived from deposition of finest sediment of the Colorado River. When dry and in its natural state it exists in hard cakes and lumps. After irrigation the soil dries very hard, and cracks intersect the surface in all directions. Difficult to till. Little under cultivation. Sorghum and millet produce good crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	1.93	7.09	36.69	47.22
Subsoil	1	.74	8.98	34.18	49.12

	Acres.
Imperial sheet, California	23,120

Jordan clay.—Tenacious clay or clay loam 6 feet or more in depth. Level, low-lying plains, poorly drained, generally containing large quantities of alkali. Origin, lacustrine deposits. This soil has little present agricultural value, on account of poor drainage, general occurrence of alkali, and impervious nature of the material.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	7.74	20.72	27.60	26.93
Subsoil	8	6.83	9.72	31.53	32.15

	Acres.
Salt Lake sheet, Utah	18,510

Neuse clay.—Dark, tenacious, mottled gray clay, 3 feet or more in depth. Stream deposit, often subject to overflow, occurring along stream bottoms in coastal plain region of North Carolina. Poorly adapted to agricultural purposes on account of close, sticky nature and poor drainage, but when well drained it is good cotton land.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	9.35	23.64	38.66	21.23
Subsoil	1	13.38	11.02	29.70	40.85

	Acres.
Craven sheet, North Carolina	14,930
Kinston sheet, North Carolina	2,010
Newbern sheet, North Carolina	8,170
Princeton sheet, North Carolina	1,030

Orangeburg clay.—A gray or reddish-brown sandy loam or red loam 8 inches deep, underlain by red sandy clay. Contains some gravel and iron concretions. Occupies upland ridges or rolling slopes. Derived, probably, from Lafayette formation. Cotton principal product. Corn, wheat, and oats also grown. Supposed to be the finest Cuban-filler tobacco soil.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	21.74	47.17	15.60	12.50
Subsoil	3	14.08	32.27	23.15	30.71

	Acres.
Perry County sheet, Alabama	82,752

Penn clay.—A dark Indian-red to dark reddish-brown sticky loam about 8 inches deep. Subsoil a dark Indian-red clay loam grading into a stiff clay. Occupies gently rolling upland series of low ridges. Drainage good. Of residual origin from Triassic red sandstone and shale. Wheat, corn, and grass are principal crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	5.79	16.30	34.63	43.85
Subsoil	2	2.76	8.19	29.11	59.85

	Acres.
Buckingham sheet, Virginia	16,128

Porters clay.—Reddish-brown clay loam, 6 inches deep, underlain by stiff red tenacious clay to depth of 20 inches or more. Both soil and subsoil contain a large percentage of stone. Occupies mountain slopes. Residual soil derived from granite and other crystalline rocks. When not too stony and rough good soil for corn, wheat, and grass. One of the important apple soils of the mountains.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	10	10.26	13.86	25.41	49.44
Subsoil	10	14.50	18.25	26.76	34.16

	Acres.
Bedford sheet, Virginia (mapped as Porters red clay)	28,240
Buckingham sheet, Virginia	5,568
Harrisonburg sheet, Virginia	10,944
Mount Mitchell sheet, North Carolina	98,624
Taylorsville sheet, North Carolina	7,552
Waynesboro sheet, Virginia	16,000

Sharkey clay.—Soil is a stiff, waxy clay, 8 inches deep, varying in color from black to light chocolate, and containing lime and iron concretions. Subsoil is a stiff, impervious clay, similar to soil. Surface sun cracks readily. Locally known as "buckshot" land. A poorly drained soil occupying lowest portions of river bottoms. Subject to overflow annually. When diked and well drained it is a strong soil, suited to corn, sugar cane, and cotton.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	9	2.14	7.40	42.55	46.36
Subsoil	9	1.69	3.88	38.58	53.91

	Acres.
Alvin sheet, Texas	32,960
Bentonia sheet, Mississippi	7,488
Brazoria sheet, Texas	100,096
Mayersville sheet, Mississippi	87,100
Smedes sheet, Mississippi	141,952
Union County sheet, Kentucky	4,032
Yazoo sheet, Mississippi	97,280

Suffield clay.—Clay loam, 12 inches deep, underlain by close-textured laminated clay. Lacustrine deposit. Very poorly drained. Level areas in Connecticut Valley. On account of poorly drained condition and close structure it is not adapted at present to any agricultural purposes, although used to some extent for pasturage.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Subsoil	2	.35	8.57	62.12	24.57

	Acres.
Hartford sheet, Connecticut and Massachusetts	13,370

Susquehanna clay.—Clay loam 6 inches in depth, containing gravel, overlying stiff, tenacious red or white pipeclay. Hills and rolling land on the western border of Coastal Plain region, Maryland and adjoining States. The type is very refractory, hard to cultivate, and has at present little or no agricultural value.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	7	7.53	17.52	36.90	34.11
Subsoil	5	2.75	12.15	29.45	50.27

	Acres.
Cecil County sheet, Maryland	11,000
Harford County sheet, Maryland	4,890
Prince George County sheet, Maryland	22,360

Vernon clay.—A red clay or heavy clay loam about 9 inches deep, in some localities containing a small percentage of rounded quartz gravel. The subsoil is a heavy, sticky, red clay. It often contains waterworn gravel from 3 to 4 inches in diameter. Derived from the Permian red beds, and is the underlying basal clay of the Vernon loam. Principally used for pasture.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	1.82	24.76	58.94	14.08
Subsoil	2	1.29	19.18	61.38	17.68

	Acres.
Vernon sheet, Texas	22,592

Yazoo clay.—Heavy drab clay loam 5 inches deep which sun cracks to a state closely resembling "buckshot land;" subsoil drab clay 5 to 40 inches, usually underlain by sand below 5 or 6 feet. Low areas to rear of front lands and higher ridges in open forest lands in river deltas. Usually would be improved by drainage. Northern areas corn; southern areas finest cotton soil, yielding from $1\frac{1}{4}$ to $1\frac{3}{4}$ bales per acre.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	18	1.24	9.72	57.79	29.99
Subsoil	18	.78	9.28	55.31	33.40

	Acres.
Alvin sheet, Texas	3,520
Bentonia sheet, Mississippi	704
Brazoria sheet, Texas	5,632
Clinton County sheet, Illinois	5,376
Mayersville sheet, Mississippi	20,680
Posey County sheet, Indiana	30,720
St. Clair County sheet, Illinois	26,944
Smedes sheet, Mississippi	37,056
Tazewell County sheet, Illinois	13,696
Union County sheet, Kentucky	24,448
Yazoo sheet, Mississippi	24,400

ADOBE.

Fullerton sandy adobe.—Brown, sandy adobe to a depth of 5 feet, underlain by compact sand or sandstone. Residual material derived from weathering of underlying shaly sandstone. Foothills extending down into level valley lands. Dry-farmed to wheat; when irrigated used to some extent for citrus fruits.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	5.33	34.39	38.95	17.57
Subsoil	1	2.44	29.34	45.74	19.28

	Acres.
Santa Ana sheet, California	31,334
Ventura sheet, California	1,940

Maricopa sandy adobe.—A yellowish-brown or reddish sandy adobe 6 feet or more in depth. Occupies lower levels. Drainage good. Owes its origin to stream wash and disintegration of Cretaceous rocks. Contains some alkali. Alfalfa principal crop, but good yields of sorghum, corn, wheat, and oats are produced.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	7.39	50.10	27.19	15.61
Subsoil	2	5.92	44.63	24.28	25.31

	Acres.
Holly sheet, Colorado	1,024
Lamar sheet, Colorado	9,280
Las Animas sheet, Colorado	13,056
Rockyford sheet, Colorado	13,888

Penuelas adobe.—Brown loam with marked adobe properties, 13 to 15 inches deep, underlain by cracked and broken volcanic tufa. Derived from disintegrated volcanic tufa. Occupies hills and gentle slopes around Penuelas. Too dry except for pasture. Some bananas grown on moist spots.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	13.35	17.75	27.44	41.19
Subsoil	1	58.88	22.70	8.64	9.42

	Acres.
Arecibo sheet, Porto Rico	6,680

Portugues adobe.—Heavy, dark brown or black loam resembling adobe, 6 to 17 inches deep, formed from decomposed limestone. Occupies parting valleys and gentle slopes around limestone hills in southern part of area. Soil is underlain by heavy light-brown loam, becoming lighter in color with increasing depth. Devoted chiefly to pasture, but produces sugar cane and bananas where irrigation is practicable. A large part of the area lies too high for irrigation.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	5.43	19.29	41.56	33.33
Subsoil	2	4.47	13.67	43.68	37.88

	Acres.
Arecibo sheet, Porto Rico	4,010

Salinas gray adobe.—Dark-gray adobe, grading in texture from sandy loam, containing considerable fine gravel, to silt loam. Occurs about edge of foothills and extends into the bottom lands. Thirty inches or more in depth, usually underlain by a fine sandy loam and fine sand, occasionally by coarse sand and gravel. Seems to be derived largely from granitic material. Adapted to barley and other grains and sugar beets. A loose, friable, and excellent soil if irrigated and properly cultivated, but refractory if allowed to bake. Generally free from alkali.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	2	8.61	21.32	33.96	32.65
Subsoil	3	19.26	32.39	23.79	21.26

	Acres.
Salinas sheet, California	9,950
Soledad sheet, California	8,450

Salt River adobe.—Clay loam with adobe properties, 2 feet deep, underlain by sandy loam or loam. Low-lying land, containing alkali, and rather poorly drained. Sediment of prehistoric irrigation with muddy water. Generally adapted to alfalfa and small grain.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	5	4.17	30.18	30.65	28.45
Subsoil	3	1.69	44.31	25.14	23.77

	Acres.
Salt River Valley sheets, Arizona	13,655

San Joaquin black adobe.—Heavy black or brown adobe soil 4 to 6 feet deep. Subsoil varies from sandy adobe to heavy clay adobe, or it may be decomposing shale. Margins of valleys along foothill streams in California, often extending out into the valleys. Derived from crystalline rocks or shale. Soil is difficult to till, but very productive. Adapted to grain crops, and used at present for citrus fruits where water supply is adequate.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	14	5.70	17.92	40.87	30.28
Subsoil	13	2.04	12.50	46.11	35.07

	Acres.
Fresno sheet, California	5,664
Hanford sheet, California	5,470
Lamar sheet, Colorado	640
Las Animas sheet, Colorado	2,240
Rockyford sheet, Colorado	1,216
Salinas sheet, California	11,580
San Gabriel sheet, California	23,650
Santa Ana sheet, California	16,038
Ventura sheet, California	4,290

San Joaquin red adobe.—Sticky red adobe, with texture of loam, 6 feet in depth; usually a layer of red sandstone hardpan in lower 3 feet. Margins of plains adjacent to foothill streams; derived from foothill stream wash. Adapted to grain crops.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	3	17.71	45.32	23.94	10.57
Subsoil	1	15.03	36.28	26.27	18.86

	Acres.
Fresno sheet, California	12,691

Sierra adobe.—Sandy adobe containing small amounts of gravel to a depth of 2 or 3 feet, generally underlain by red sandstone hardpan or granite rock. Low foothills. Residual soil derived from decomposition of underlying granite, used to some extent for dry farming wheat and barley.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	13.10	55.60	19.65	8.82

	Acres.
Fresno sheet, California	13,376

MEADOW.

Meadow.—When this term is unqualified it stands for low-lying, flat, usually poorly drained land along streams and embayments. Generally adapted to grass and pasturage, and occasionally used for general farming where artificially drained.

	Acres.
Abbeville sheet, South Carolina	4,480
Alamance sheet, North Carolina	15,970
Allegan County sheet, Michigan	15,510
Bedford sheet, Virginia	3,530
Bentonia sheet, Mississippi	17,408
Bigflats sheet, New York	1,920
Buckingham sheet, Virginia	11,776
Calvert County sheet, Maryland	15,800
Cary sheet, North Carolina	3,180
Clayton sheet, North Carolina	2,730
Cobb County sheet, Georgia	30,280
Covington sheet, Georgia	16,410
Dubuque sheet, Iowa	4,160
Due West sheet, South Carolina	1,856
Fresno sheet, California	5,478
Harford County sheet, Maryland	4,440
Harrisonburg sheet, Virginia	12,992
Hartford sheet, Connecticut and Massachusetts (mapped as Connecticut Meadow)	19,620
Hickory sheet, North Carolina	14,336
Janesville sheet, Wisconsin	18,112
Kent County sheet, Maryland	49,230
Lancaster County sheet, Pennsylvania	6,000
Lebanon sheet, Pennsylvania	4,780
Lyons sheet, New York	35,008
Montgomery County sheet, Ohio	7,200
Mount Mitchell sheet, North Carolina	6,976
Perry County sheet, Alabama	53,696
Prince Edward sheet, Virginia	19,830
Prince George County sheet, Maryland	30,870
Princeton sheet, North Carolina	3,600
Roswell sheet, New Mexico (mapped as Hondo Meadows)	7,940
St. Mary County sheet, Maryland	54,200
Salem sheet, New Jersey	52,250
Salt Lake sheet, Utah (mapped as Jordan Meadows)	6,840
Sevier Valley sheet, Utah	10,200
Statesville sheet, North Carolina	18,850
Sunnyside sheet, Washington	5,100
Taylorsville sheet, North Carolina	9,536
Trenton sheet, New Jersey	44,800
Waynesboro sheet, Virginia	15,872

	Acres.
Weber County sheet, Utah	7,700
Westfield sheet, New York	4,990
Willis sheet, Texas	1,510
Yakima sheet, Washington	9,960
Yazoo sheet, Mississippi	4,760

MUCK AND SWAMP.

Muck.—Vegetable mold more or less thoroughly decomposed and mixed with earth, occurring in low, damp places.

	Acres.
Allegan County sheet, Michigan	33,770
Craven sheet, North Carolina	20,860
Grand Forks sheet, North Dakota	6,592
Janesville sheet, Wisconsin	10,368
Kinston sheet, North Carolina	5,430
Lyons sheet, New York	3,840
Newbern sheet, North Carolina	1,740
Princeton sheet, North Carolina	800

Peat.—Vegetable matter consisting of roots and fibers, moss, etc., in various stages of decomposition; occurring as a kind of turf or bog, usually in low situations, always more or less saturated with water.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	4	22.78	35.79	23.89	7.97

	Acres.
Bigflats sheet, New York	576
Santa Ana sheet, California	787
Tazewell County sheet, Illinois	1,664

Pocoson.—Consists for the most part of a close, impervious, fine sandy gray or ash-colored soil lying on low ridges 3 to 6 feet above level of surrounding land, in the depressions between which the soil is darker colored, more spongy, and mucky in character. At a depth of 10 to 15 inches the soil grades into a sandy clay subsoil. Occupies swamp areas on low divides from 30 to 50 feet above sea level, with a flat surface, except for the slight ridges above referred to; derived from the accumulation of organic matter in depressed

areas under swamp conditions, not subject to overflow, but under water for at least a part of the year. Generally in forest varying from a scrubby to a heavy growth, beneath which there is a dense, practically impenetrable undergrowth of shrubs, vines, briers, and rank grasses. Areas vary much in fertility and need drainage, which is practicable. Better tracts are very fertile, and small areas cultivated grow excellent crops of corn and cotton. Occurs in Coastal Plain region, South Atlantic States.

Average mechanical analysis.

Description.	No. of samples.	1	2	3	4
Soil	1	14.70	47.86	15.24	2.81

	Acres.
Craven sheet, North Carolina	75,300
Kinston sheet, North Carolina	12,410
Newbern sheet, North Carolina	61,700

Savanna.—Soil consists of 3 to 9 inches of black, mucky soil, grading into a dark gray, fine sandy loam with silt, having the texture of the typical surface covering of Norfolk fine sandy loam. Below 6 to 12 inches occurs a subsoil of stiff, sticky yellow or mottled yellow clay. Found in broad, very level, and extended open areas in Coastal Plain, with an elevation ranging from 10 to 30 feet. It is a sedimentary soil. Because of attitude the drainage is very poor, and water stands on surface after rains. Very little savanna under cultivation. Yields fair crops of cotton, corn, and hay. Formerly used for upland rice. Natural growth scattered pine, sedge grass, saw palmetto, and cane.

Average mechanical analyses.

Description.	No. of samples.	1	2	3	4
Soil	4	12.51	38.82	34.34	11.43
Subsoil	2	4.54	30.23	19.65	41.24

	Acres.
Craven sheet, North Carolina	28,670
Newbern sheet, North Carolina	3,330

Swamp.—A condition of soils too wet for any crop. Generally with a heavy growth of water-loving grasses, herbs, or trees. Occurs in nearly all areas in the humid States. Usually indicated on map by symbol rather than by color.

	Acres.
Billings sheet, Montana	3,008
Calvert County sheet, Maryland	3,600
Darlington sheet, South Carolina	14,144
Hartford sheet, Connecticut and Massachusetts (mapped as Connecticut swamps)	14,470
Lamar sheet, Colorado	384
Rockyford sheet, Colorado	256
St. Mary County sheet, Maryland	2,200

INDEX.

[Soil types recognized by the Bureau. The names in *italics* having been correlated with other soils are no longer to be used.]

SOIL TYPES ARRANGED BY CLASSES.

SOILS ACCORDING TO STATES.

Expenses for April, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for April, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for May, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for May, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for June, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for June, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for July, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for July, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for August, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for August, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for September, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for September, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for October, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for October, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for November, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for November, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for December, 1903.

Date.	Item.	Dollars.	Cents.

Expenses for December, 1903—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for January, 1904.

Date.	Item.	Dollars.	Cents.

Expenses for January, 1904—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for February, 1904.

Date.	Item.	Dollars.	Cents.

Expenses for February, 1904—Continued.

Date.	Item.	Dollars.	Cents.

Expenses for March, 1904.

Date.	Item.	Dollars.	Cents.

Expenses for March, 1904—Continued.

Date.	Item.	Dollars.	Cents.